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BALTIMORE, THE A.V.A. CONVENTION CITY

Baltimore, the "Monumental City," will be host to the American Vocational Association from December 1 to 4, 1937. The local committees are doing their utmost to make this convention a real success.

This year's convention, the thirty-first, if we start our count from the first one held by The National Society for the Promotion of Industrial Education in 1906, has chosen for its convention-program theme, "Vocational Education and Progress — American Style." As usual, all phases of industrial arts and vocational education will be covered by the program, and it is expected that the attendance will represent proportionately wide areas of interest.

The city of Baltimore itself has much to commend it to the visitor. Founded in 1729, it is rich in historic interest. Besides this, it combines the romance of the South with the commercial and industrial bustle of the North.

Those interested in studying industrial processes at first hand, will have an opportunity to visit the Bethlehem Steel Co., the Chevrolet plant of General Motors, and many other interesting industrial plants. Educationally, too, Baltimore has much to offer the visitor, and attendance at the A.V.A. convention can be made very much worth while from this angle.

As this year marks the twentieth anniversary of the passage of the Smith-Hughes Act, and as the George-Deen Vocational Law has just recently gone into effect, much may be learned of what has already been accomplished and what is to be expected in future of these two federal aids to vocational education.

Considering all of the good things offered by Baltimore and the American Vocational Association at this, the 1937 convention, probably the best advice to give is:

Make your hotel reservations at once!

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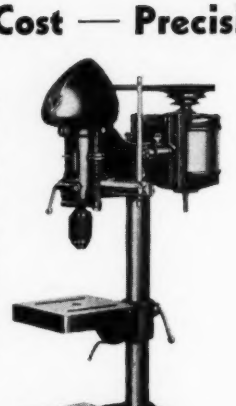

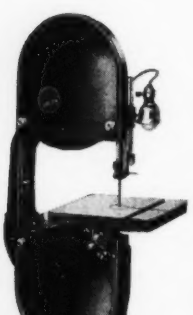

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November, 1937
Vol. 26, No. 11

INDUSTRIAL ARTS and VOCATIONAL EDUCATION

A Philosophy of Industrial-Arts Education

William L. Hunter
Department of Industrial Arts,
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Ames, Iowa

(Concluded from page 316, October, 1937, issue)

Then, as a part of this better social order, we and our students, must study more completely and comprehensively than ever before the function and significance of a mechanized civilization. These have been both the instrument of man's emancipation and the instrument of his imprisonment. Let's emancipate man still further; let's study and solve those problems which have been the cause of his undoing. This may be illustrated with a few examples taken from the fields of communication and transportation. What about huge trucks and our paved highways? What about the 25,000 deaths from automobile accidents last year? What about grade-crossing accidents? What about exorbitant telephone rates and the inability of any person or group in the land to deal justly with the A. T. and T. Co. What about the drunken driver? What about the radio and offensive, monotonous advertising? What about television? These are only suggestive questions from but one field. Each question, if studied and considered, might take a week. Somewhere by somebody these questions which have arisen because of the mechanization of transportation and communication must be answered. You say that you aren't capable of answering these questions for your students. Neither is anyone else. But society can answer them in two decades or less if the problems are studied now in the public school. And they will be answered far more correctly than the Supreme Court has answered certain questions recently. As industrial-arts teachers, we must become sociologists and economists, not we alone but all teachers and all pupils. It is just as necessary in a democracy as it is to know how to read and write. Teachers must assume a more modest attitude toward their ability to answer the problems of the social and economic world. We may as well admit, as everyone else has had to admit, that there is a lot that we don't know. As someone has said, "To be conscious of our ignorance is a long step toward wisdom." "The path of progress," says A. F. MacDonald, the economist, "is long and steep, but only weaklings turn back and only fools despair."

These big social and economic problems are no skeletons of dried bones in the attic of American thinking. They are so much alive that in some communities great diplomacy must be used if they are discussed.

A New England city was very much in danger during the recent unprecedented flood. The city was located in a narrow valley through which a tireless and temperamental river found its way to the sea. Twenty miles upstream there was a high dam to hold back the flood waters. Because a dam in an adjoining state had failed the day previously and because the hungry, slimy flood waters were already in their houses, the people of the city were frantic lest the dam should break, and because of the suddenness of the deluge they and their loved ones would perish. Because telephone, telegraph, and highway service had been destroyed, genuine fear was justified. The amateur wireless operators, however, came to the rescue. A portable sending and receiving set was hurriedly improvised and one of the amateurs located himself with the set at a vantage point above the dam. Soon after he had taken up his position, a rumor of unknown origin was spread abroad in the city below that the dam had broken. But one of the city amateur operators sent a message to the man at the dam, "Has the dam broken?" In dots and dashes the magic message came back, "No, the dam hasn't broken." And so the fear of the people was temporarily allayed. Before long, however, the water rose higher and again a panicky rumor was spread that the dam had broken. Again the unmistakable message of science came back, "No, the dam hasn't broken." A full twenty times during forty-eight critical hours, the man who held the lone watch at the dam sent back the same answer, "No, the dam hasn't broken."

The deluge of social changes of the last one hundred fifty years has caught the people of the United States unprepared. The crest of the flood, in my humble opinion, has not yet been reached. Mothers and fathers of American children are fearful lest the dam of pent-up feelings, hatred, hunger and unemployment shall break and that the turbulent and murky waters of revolution and dictatorship shall destroy their homes, their property, and their families. May we as educators, like the amateur radio operators, establish in our public schools a continual watch over the social and economic destiny of our nation and may the answer forever come back, "No, the dam hasn't broken."

School-Shop Environment

The third and last guiding star is the tremendous importance of an appropriate environment in which industrial-arts education is to take place. Psychologists tell us that environment has much more to do with our growth and development than we had anticipated. Of course we might have guessed this when we saw the large and beautiful tree in the valley and then saw the same kind of tree near the mountain top but looking like a scrawny shrub. But human beings go to endless length to learn the lessons which might be simply learned from nature. Of course this does not mean only the physical environment. One cannot endorse unqualifiedly a laboratory which contains from fifty to a hundred thousand dollars worth of equipment. It is not the environment only but the use that is made of it. "Better Mark Hopkins in a miserable barn," says F. L. Pattee, "with a shred of equipment, than a half-baked instructor in a marble laboratory equipped with the last word in apparatus."

"The secret of education," said Emerson, "lies in respecting the pupil." This respect is just as much a part of environment as surfacers and sanders and by all odds more important. In a certain university town,

there is no respect for a person who works with his hands. The professor who works in his garden or walks down the street with a suit of working clothes on is just snubbed from then on. There is no respect for anyone who does not use polysyllable words and talk glibly about profound doctrines. You would think that a certain class of college professors had been born into the world wrapped in cellophane. As Josh Billings said, "It's better to know less than to know so much that ain't so." Anyhow, there is no atmosphere of respect for industrial-arts education in that high-brow university town, and it would take years before such respect could be built up.

Another element of environment which is absolutely essential for first-rate industrial-arts education, is an experimental atmosphere. I went to one of my teachers when in high school and said, "I would like to make a rocking chair." He looked at me in amazement. His chin fell. Finally, he said, "Good Lord, boy, I never made one of those things myself." That was hardly an experimental atmosphere, but I labored and figured, wiggled and sweat to get that rocking chair done. I never learned so much elementary trigonometry in my life, but it was a glorious experience. In an experimental atmosphere, we are not afraid intelligently to question authority; we are encouraged to try the new and to pioneer in something that hasn't been done. When you see a teacher trying nothing new, it's a pretty certain sign that the pupils aren't encouraged to either. Education to be real education must lead the pupils out. That's what industrial-arts education must do. It isn't hard to recognize the industrial-arts laboratories where the pupils are leading out. I went into a general electrical shop not long ago. I found many things going on which were new to me. The students under their own direction, but with encouragement from the teacher, had rewound a couple of old motors so that they had a motor generator set for electrical welding. They were doing some nickel plating; one boy was working on this kind of an experiment, and another on something else. There was activity and mental electricity in the air. The boys were alive and on their toes.

Experimental Attitude

It's just as easy to discover an experimental attitude in an industrial-arts laboratory as it is for a prospective visitor to a home to discover a smallpox sign. The one invites you in quite as forcibly as the other tells you to stay out.

Many teachers are guilty of not encouraging the experimental attitude. If a boy asks a peculiar question, he is laughed at. That encourages him to keep still next time. It is well to remember that the best teaching places the greatest premium on the exposure of ignorance.

To live in an experimental environment is to thrill when a new idea is discovered and to see the look of encouragement from the teacher to go ahead full steam to try out the idea. There is no great learning without great emotion. He who would be a really great teacher must feel the pulse beat of his pupils.

Cynicism has no place in an industrial-arts laboratory. You have probably heard of the definition which states that, "A cynic is a man who cuts off his dog's tail so as to eliminate from the world that much expression of happiness." Neither has fear any place in industrial-arts education. The sooner that inflexible paternalism is booted out of the window the better. The experimental environment is seldom found where there is carping criticism; it is incompatible with egotism. It is not guaranteed by any one thing, but it can be as definitely discerned as can the industrial-arts laboratory itself.

Then this environment for industrial-arts education should also embrace the esthetic. The walls of our laboratories should be finished just as nicely as the walls of the superintendent's office. There should be art pictures on the walls. The sewer pipes, water pipes, steam pipes and so on, which usually clutter up the ceiling, should be removed; cabinets and lockers should be built in. In other words, the laboratory should look like an arts laboratory and not like a junk shop.

When you consider how some shop teachers don't keep shop, you can hardly blame superintendents for putting us off in some out-of-the-way corner of a dark basement. An industrial-arts laboratory should be a place of beauty as well as industry. When it is, you will find that the pupils take a great deal of enjoyment in bringing in visitors.

Then there are environmental factors which affect physical and mental health. The concrete floor in an industrial-arts laboratory is a man killer; long ago, most of us suspected that our places of work were inadequately lighted; long ago, everyone knew that the heating and ventilating systems were inadequate in most schools; more recently have we learned that there is little excuse for so much noise as we have in an industrial-arts laboratory. These factors in the school-shop health environment, we hope, will be much improved within the next decade.

Then we must have an environment which is conducive to moral health as well. Last fall, another fellow and I roamed the woods of northern Minnesota. I like trees; they have so many traits which man may well copy. As I was going through an area of tall timber, I noticed one tree in the distance that appealed to me more than the rest. The light and dark of the forest shadows played upon its bark in a way that drew my attention like a magnet. I thought, "What a fine tree!" As I got up to the tree and was attempting to estimate its diameter I noticed a growth near the bottom of the tree similar to a large toad stool. With quick alarm I looked upward. Sure enough, some of the leaves and branches were dead. The beauty of that tree was being eaten away by the fungus saprophyte feeding on its innermost fibers.

When one sees the high crime rate of the people of the United States, one cannot help but wonder whether the teachers of the land have been as careful as they might in providing high moral environment for youth. Will some historian in another era discover the tall and stately tree of the United States with its life blood gone because of the fungus saprophytes of crime and immorality? May the teachers, especially the shop teachers provide that answer, and may that answer be "No." May the United States be like the giant Sequoias of California, though thousands of years old, though beset with storm and fire, yet living on and on though all else dies.

Finally, and of great importance is the physical environment for industrial-arts education. We need great varieties of experimental mechanisms and elements of invention in our industrial-arts laboratories. We need a materials-testing course on the high-school level. We need all kinds of motors and prime movers and sources of power. In other words, we need an experimental laboratory, rather than a production shop. We need to give pupils a vision of the great world of industrial processes, mechanisms, materials and devices. We should have museums showing the transformations which have taken place, to stir the imagination of future Franklins, Edisons, Fords, and Steinmetzs. "The genesis of genius is inspiration," and we need men who can evolve an even greater culture from the wheels, gears, and bearings of this old world.

It is to be hoped that the industrial-arts teachers of this country will catch a vision of the great strides yet to be made in industrial-arts education. In many ways, we are still laboring with "horse-and-buggy" ideas. We need to let loose and grapple with our philosophy. We need more than ever before to work with and not against the currents of natural human interests. We need to paint a glorious picture of a better world to be. We need to make all that touches the life of the child fine and challenging and true. The industrial-arts teacher is presented with a great opportunity. It is sincerely hoped that he may use it.

Social Change Challenges The Industrial-Arts Program

James L. McRae

Minneapolis, Minnesota

We live in a period of rapid change. Countless factors which are new to human experience influence our lives. Kaleidoscopic changes have resulted from industrial development, social evolution, shifts in political philosophies, and commercial innovations. Education has felt this turn of affairs, and as changes occur, the need for continuous curriculum revision becomes apparent. Every subject field is receiving rigorous scrutiny. Studies have been made to determine the beneficial, and to eliminate antiquated subjects, materials, and methods.

The experts in every field are called upon to justify the inclusion of subject matter in terms of student needs and educational outcomes. Research determines the proper grade level for subject material, methods of teaching, and decisions are made as to what field or fields shall assume responsibility for the required training. These evaluations will decide what subjects of study are to be radically altered, curtailed, or eliminated, and what new subjects of study are to be introduced.

Teachers in the industrial-arts field must be made conscious of the challenge which this state of affairs implies. There are a certain definite number of recitation periods in a school day. Unless industrial arts can be made even more vital to the individual student, some subject or group of subjects may displace them on the program. Teachers of these subjects which have recently been added to the program of studies must be particularly alert for in many instances the decision on the fate of these subjects rests with those having little or no training in or understanding of these special fields.

The methods, procedures, and objectives of industrial arts have changed markedly since they were first introduced into the educational system of our country. Changes will continue to occur. They may be made on the basis of trial and error, because of the demands of pressure groups, or after consideration of the aims of general education, the objectives of the grade levels in which they are taught, the political theories of the state, the social forces at work, educational psychology, and the educational results desired. If the latter methods are practiced, industrial arts can be made essential subjects of study.

The limits of this paper confine consideration of our problem to industrial arts at the junior-high-school level in a school having student numbers justifying an offering of at least six industrial-arts subjects. It should be apparent that national goals, aims, or objectives, political belief, temperament, as well as economic, ethical, industrial, and social influences all determine educational goals. An educational program for the United States would vary markedly from one for a European dictatorship. To be specific, the junior high school is a product of and only possible in a democracy.

Brief consideration will be given to democracy, social evolution, general education, the junior high school and suggestions will be made for an industrial-arts program in harmony with such consideration.

The Concept of Democracy

The *Encyclopedia Americana* defines democracy as that form of social organization in which participation of each individual in the various phases of group activity is free from such artificial restrictions as are not indispensable to the most efficient functions of the group, and in which group policy is determined by the will of the whole people. The founders of this republic indicated their intentions in the preamble of the Constitution which states that: "We, the people of the United States, in order to form a more perfect Union, establish Justice, insure domestic Tranquillity, provide for the common defense, promote the general Welfare, and secure the Blessings of Liberty to ourselves and our Posterity, do ordain and establish this Constitution for the United States of America." The Bill of Rights which forms the first ten amendments to the Constitution guarantees freedom of worship, speech, and the press, the right of petition, speedy and impartial trial, sacredness of life and property unless forfeit through due process of law, favoritism to none, and the opportunity for every individual to develop his abilities without regard to his birth or social status. The body of the Constitution indicates the means of supplying the machinery to attain these purposes. The founders of our government were aware of the difficulties they faced in attaining and maintaining a democratic form of government. They were soon convinced that an educated citizenry was necessary to make their vision a reality. We have had a number of statements of the objectives of education which have attained popularity, such as the seven cardinal principles and the Children's Charter, but no statement can compare with the Preamble and the Bill of Rights as to the primary goal of American education. The curriculums are contrivances which the citizenry has adopted to further and perpetuate the principles outlined in our basic law. In order that any subject may survive, the individual citizen must be convinced it does contribute to the development of our democratic institutions.

The opportunity and responsibility of the industrial arts in preparing the child of today for living under our present mode of life.

The true educator cannot compromise in his basic philosophy of government. The charge is sometimes made that dictatorship, or some other form of autocracy, would be more efficient than democracy. Even though the claim could be substantiated, the price would be too high. By the same token the instructor could produce a product for the student with less expenditure of effort, material, and time than would be required to train the student. The important consideration is what happens to the producer rather than the quality of the product. Americans have always believed that they were capable of governing themselves and have always been willing to sacrifice the efficiency of slavery in order to learn to control themselves.

As our country continues to shift from an agricultural and debtor nation to an industrial and creditor nation many economic and social changes will result. In 1787, man was interested in his political and individual rights and he sought equality before the law. The next development was his fight for economic rights and equality of opportunity. We are entering a third phase of our national existence which many believe will be a struggle for equality of security. Disease, poverty, and crime are the three factors which have caused men to think of security against illness, idleness, needy old age, and the lawless elements. Many are thinking of the problems involved in a more equitable distribution of income and wealth. Many radical proposals are being advanced to attain

financial security. These have to do with control of industry, commerce, income, inheritance, taxation, and governmental distribution of money. Certain conservatives oppose reasonable governmental restraint. Personal interests rather than patriotism determine the individual viewpoint. Education must provide training in the weighing of evidence to guard the future citizen from propaganda and inculcate the social rather than the personal outlook on life. The industrial-arts program must contribute toward the solution of these problems.

Changes That Have Come About

Many gains have been made during the past one hundred fifty years which we sometimes forget. Universal suffrage is a very recent development. The secret ballot is comparatively new. Slavery is illegal. Children and women cannot be exploited for the pleasure or profit of men. It is almost universally agreed that a workman is entitled to a decent living wage and that he should not be required to toil from dawn to dark to earn his livelihood. The purchase of votes, intimidation of voters, or dishonesty in government are not approved by the mass of the people. Education at its best assists in extending the gains it has helped to attain that the aims of the founders of this nation may be more fully realized.

Present-day education must not only be in accord with democratic principles but it must provide the student with a vision of better social order and the training which will assist him in attaining it. According to Dewey, "society is democratic insofar as an individual member of a particular group shares intelligently in all of its activities and interests, and insofar as each group within the larger society sustains intimate and varied contacts with the other groups."[1] This provides a real and definite challenge to one interested in curriculum revision for to the degree that it is democratic it will assist the individual to share in the responsibility of significant social change.

Cultural changes have been comparatively rapid and particularly so during the past one hundred fifty years. Discoveries of man result in invention and cultural advance which in turn results in new discoveries, inventions, and culture. This change in material culture affects every living person and causes many social maladjustments.

The most apparent changes in society caused by discovery and invention have been due to the transfer of industry from the home to the factory and then to the large manufacturing plants. The home and family life, church, recreation, business, economic organization, transportation, communication, and the school have each been modified and each in turn has affected the others. Courses of study must be revised to assist the individual to understand the causes of these changes and to avoid unproductive experimentation in effecting equilibrium between them. Man has proved himself an adaptive being in adjusting his institutions to the discoveries and inventions which have changed his physical life, but the question arises as to whether he can be expected to make these shifts haphazardously as he has in the past. Education must assume part of the burden and industrial arts can make a substantial contribution.

The School

The average American views the public-school system as the most effective means of furthering democracy and attaining an improved social order. Although other factors have been at work, the faith of the citizen in the school's effectiveness in improving the potentialities of the individual has been the chief cause of the high-school population increasing twenty times faster than the population of the country since 1890. In recent years, educational theory has tended away from mere memorization of facts. Educators give a student practice in a democratic situation so that he will become an effective national citizen by learning to be a good school citizen. They assist the child in arranging facts and acting on them unemotionally, develop his character, provide him with interests which he can develop during his leisure time, and awaken and develop vocational interests which will result in later life activity for the benefit of himself and society. This shift in emphasis has resulted from the decline of authoritativeness as a means of developing the individual. We may think of education as that controlled stimulus to which the individual is subjected, which will change him from what he is to what it will be best for him to be. In a democracy the "what it will be best for him to be" will be those attitudes, skills, and habits which will make him an effective worthwhile citizen of that nation.

Man has used informal teaching from his earliest existence. The young learned from the older without either being aware that teaching was taking place. As one generation succeeded another, additional learning took place. Perhaps the first formal training occurred when the male children of the group were given to the care of the ablest fighters and hunters. When language and the art of writing were developed, it was discovered that special skill was necessary to teach these abilities efficiently and that this efficiency would prevent the loss of knowledge gained in the past. For this purpose, it was but a step to set up a formal agency, the school.

In modern times the skills, knowledges, and attitudes considered necessary for all were taught until the individual had attained an understanding of the essentials, the three R's. This was the offering of the elementary school. Advanced training given in the academy and high school was cultural and preparatory in character. College and university offerings were cultural and professional. In the early 1800's this arrangement was at least partially adequate, but in the latter part of the nineteenth and the early years of the twentieth century the elementary school failed to provide a democratic situation. It failed to hold those lacking verbal ability, did not provide for individual differences, was not economical in use of time, did not concern itself with guidance, did not avail itself of many of the new discoveries concerning adolescence; and the upper grades were given over to review of work already covered. Consequently a large per cent of the children were maladjusted and became chronic troublemakers. Because the violent break between the elementary school and the high school came at the end of the eighth grade, students were unintentionally encouraged to withdraw at an early age.

The Junior High School

Because of these inadequacies in the elementary school a far-reaching reform movement began about 1910 resulted in the complete revision of the educational system of many communities. In place of the elementary- and high-school organization, a new combination of an elementary, junior and senior high school was arranged. By 1930, the movement had spread until there were more than 1,100,000 students enrolled in 1,360 junior high schools in about 450 cities. The new schools differed from the old not only in administration and number of grades of work offered the student, but also in methods, objectives, discipline, and subjects of study offered. The junior high school was a means of giving equal educational opportunity to all in proportion to their ability to profit by it. The junior high school provides the instructional material, the situations, and the subject offerings adolescents desire.

The old schools had been primarily verbal in character, nature, and purpose. In order to provide for individual differences, exploration, and guidance in the new organizations, it seemed desirable to offer a variety of experiences to each child. Industrial arts received increased recognition because of the known contribution they could make to the development of the pupil.

For many years, the only industrial-arts

[1]Chapman, J. Crosby and Counts, George S., *Principles of Education*.

course offered to adolescents was woodwork with an occasional offering of mechanical drawing. There are a number of reasons why these subjects of study were chosen. The Russians had used abstract joint exercises to give their engineering students some knowledge of the uses of such constructions. When the world's fair was held in St. Louis an exhibit of these exercises was displayed. In a short time the schools of St. Louis began offering courses based upon this exhibit. The Sloyd movement, a system of elementary manual training originating in Sweden, which had exercises graduated from the simplest use of tools to the most complete joinery, had also found adherents in this country. No practical applications of these exercises were made in the shop. It was thought that the student would naturally make the appliance, but when experience demonstrated that this was a false assumption emphasis shifted to the making of practical articles. In several states the employers had induced the state legislature to require instruction in mechanical drawing because of their difficulty in finding employees able to read such drawings.

With the organization of the junior high school came a demand for a more diverse offering for guidance purposes. This resulted in several other subject offerings among which electricity, sheet metal, and printing were most frequent. In recent years a new subject called general shop has gained in favor, particularly in small schools. This shop offers a variety of interesting jobs in general fields, in the same classroom, at the same time. It is rather difficult to administer, although a very exceptional teacher with proper shop organization, equipment, and job sheets can do a great deal.

There are a number of reasons why industrial arts has become part of the program of the junior high school. This subject assists in accomplishing the functions of this type of school. Anyone having the slightest knowledge of adolescent boys knows that they enjoy activity of this kind, and that the industrial subjects supply the incentive for many to remain in school. The industrial-arts teacher discovered and ministered to individual differences from the very beginning of the movement. The industrial-arts courses have resulted in improved disciplinary situations because the child is interested in doing what he is doing.

Too much emphasis is being given to technique. More attention should be given to what will be the student's outlook, attitudes, and understanding of the world after contact with these courses, rather than whether he can make a certain joint, a funnel, a splice, a plate of good lettering, or set a stick of type and proofread it. It is relatively unimportant what happens to the tool or the material, what happens to the boy is the important consideration.

As has been indicated, the writer believes that a time has come to revaluate the subjects of study offerings in the light of modern educational theory. A question which demands an answer is whether revision of the subjects of study should not be considered. Too much attention has been given to certain phases of some fields to the exclusion of other phases and some of the offerings have as a consequence been incomplete.

One of the difficulties which will need to be overcome to make these proposals effective is that teachers of such subjects will need to be trained for the change in emphasis. Many of our teachers of industrial arts are those with a tradesman's viewpoint, who confine their attention to the acquisition of technique. Without a change in viewpoint the program here outlined cannot be successful.

A Proposed Industrial-Arts Course

Proposed changes would substitute a course in general metals for sheet metal. This course would include the attainment of skills in the handling of all metal materials which could be used to advantage in the school situation. Consideration would be given to the sources of the minerals most frequently used, the methods used to manufacture and fabricate these materials, the use of these materials, and the effects of this use on contemporary life. Certain skills would be attained, but the primary purpose would be the understanding of the importance of these metals to man.

The second course would consist of general woodwork. The same procedure would be used as in the preceding discussion but with wood and all allied constructional materials as the primary interest. A great deal more emphasis would be given to beauty and artistic design of articles turned out in both general metals and woodwork, than is at present the case, and considerable attention to the conservation of our supplies of these materials.

A third course, general electricity, would assist in the attainment of certain skills germane to this field. The student would learn about illumination, ignition, motors, radio, electric eye, power transmission, sound movies, television, etc., from a nontechnical viewpoint. He would learn about the effect of these devices upon present-day living. It would not be merely a course of connecting bell and light circuits.

A fourth course would be called general drawing. In this course instruction would be given in freehand, mechanical, machine, patent, and architectural drawing. The theory of graphing and map construction would also receive consideration. Certain techniques would receive attention, but the primary purpose would be to make drawing meaningful in the student's life.

The fifth course would be graphic reproduction. In this course all of the means used by man to reproduce graphic and verbal material would be used to make the child's view of this field as broad as possible. It would include some printing, but it would not be confined to setting one line of type after another. It would involve typing but not skill in typing, drawing some plate on a stencil for mimeographing, hectographing, blueprinting, photography, photostating, in fact, every means used to reproduce this type of material.

The sixth course would consist of the study of safety, machines, and power. It would be based upon safety, transportation, communication and transfer of energy into power — water, steam, oil, and electric. The child would attain some knowledge of the automotive industry — truck, bus, and passenger transportation; the railroad, passenger and freight transportation; the airplane, its construction, the various types of planes and their uses; the telephone, telegraph, and radio with attention given to their use in sending graphic material; the press, including newspapers, news-gathering agencies, magazines, and book publishing. This list is not all inclusive but it suggests the variety of material available for such a course. Liberal use of library facilities and of all justifiable visual aids, along with enriched content, and improved teaching would vitalize this proposed program.

No definite and scientific suggestion can be made as to which course should be offered at any particular grade level. The final answer would come after experiment and research. It would be advisable for each student to experience the first five suggested courses before the last course so that he would have a basis for understanding at least a few of the interrelationships which the list suggests.

Industrial education is unquestionably valuable as a part of the general education of boys because it assists them to interpret the world in which they live and gives them some idea of the work of the world and its demands for industry, accuracy, skill, and order. "Industrial arts is not designed definitely to train mechanics for the trades, but insofar as it is possible to do so through industrial courses, to produce the insights, skills, habits, and attitudes which should characterize all men living and working in a modern industrial environment."[2]

The general practice in larger schools is to give a short introductory course of several shops in the early periods of the

[2]Mays, A. B., *The Problem of Industrial Education.*

junior high school, followed by election of the desired course. The proposal here is six courses which would be constants for every boy; he would experience each course for one semester in the junior high school.

A second conviction is that attention should be given to the consumer viewpoint in each of these courses. Bonser suggests that the citizen should be assisted in learning how to buy and use industrial products so that they are well adapted for the purpose the buyer had in mind. He should be taught the proper care of industrial products, how to repair or supervise repairing when it can be done to advantage, how to substitute inexpensive for expensive products when needed, and be given simple tests for judging common products.[3]

We are interested in muscular skill or techniques, but we are not attempting to make mechanics. In the past the technique phrase has been rather overemphasized. We are seeking to impart related knowledge but related to actual physical objects as the classroom situation allows. In addition we are seeking to develop attitudes, appreciations, understandings, and habits which will contribute toward making this boy a valuable member of society.

The Purposes of Industrial-Arts Courses

Many people assume that industrial arts in the junior high school are intended to train mechanics, but future courses in industrial arts will tend more and more toward general education in purpose. The guidance function would be attained in our proposed courses since construction and manipulation skills would secure their proper attention, while informational and appreciational phases would attain an emphasis which they are not at present receiving. The modern world demands that everyone have some understanding of the machines, the skills, and the abilities required to keep our lives running smoothly. In former times, the young could observe their elders and even at times assist in the work of the world. Today, the factory displays the sign, "No Admittance," and the young are excluded from employment. Unless the school provides these learning situations which life provided in days gone by, the youth will see no further than the switch on the wall, the faucet in the bathroom, and the tin can on the shelf. Bawden[4] says that the most acceptable idea underlying educational objectives is the growth of the individual so that he will act wisely in his social groups. He maintains that the major objective cannot be attained without including a vigorous and well-conceived program of industrial-arts education as an essential component because industrial arts education provides for the development of all three sides of his nature: physical, intellectual, and emotional. Without something corresponding to the contribution which industrial arts makes to his growth the individual lacks complete and all-round development.

To summarize, junior-high-school industrial arts of the future must assist in accomplishing the functions of the junior high school, it must be a phase of general education and not vocational training. Its purposes are to make the student a more valuable member of society because he should have developed certain interests, appreciations, attitudes, habits, knowledges, and skills.

[3]Bonser, Frederick, *Industrial Arts for Elementary Schools.*

[4]Bawden, W. T., "Notes on the Philosophy of Industrial Arts Education," *Industrial Education Magazine,* March, 1933; May, 1933.

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Francis W. Parker— Pioneer of Educational Reform

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The influence which Col. Parker's life and philosophy had on education in general and particularly on all forms of activity including industrial-arts work make a brief review of his life and work valuable.

Francis Wayland Parker was born on October 9, 1837, in the village of Piscataquog, town of Bedford, N. H. His father died when he was eight years of age and the young Francis was "bound out" to a farmer. He had an intense eagerness to learn and he was far from satisfied with the limited school term. However, he gained much from the life on the rocky New Hampshire farm on which he toiled. At thirteen, after five years he left the farm, against the wishes of his family, determined to make his own way and gain an education. He enrolled in Mt. Vernon Academy and embarked on a "learn and earn" career. He made his way by sawing wood, varnishing boxes, and doing odd chores, assisted by what he could earn by working on a farm during the summer. He said he "loved to saw wood because he could think."

At sixteen he began his work as a teacher and taught in various country schools until he was twenty-five. He was then elected principal of the only school in Carrollton, Ill., where for two years, with one assistant, he taught a total of 125 pupils in all grades, including high school. His pupils ranged in age from 12 to 25. Two previous teachers had been run out of school. It is reported that Col. Parker surprised his pupils into good behavior by turning them all out of doors to clean up the school yard, drive out the hogs, repair fences, and plant seeds so that they might have a better place to play. His theories of a socialized curriculum with activity as the keynote was already taking shape at this early date.

When the Civil War broke out, he enlisted as a private. He was wounded in the summer of 1864 and was sent home on a furlough. While on furlough, he married a teacher whom he had known since childhood. Returning to the front, he served for the remainder of the war and was mustered out with the remnants of his regiment with the rank of colonel.

He then taught in Manchester, N. H.,

for several years, and in 1869 went to Dayton, Ohio, as principal of the first normal training school in that city. With a teaching experience of sixteen years, less his war experience, he began his work for the recognition of the child in education. His rebellion against "bookish" education brought upon him the enmity of many, but in spite of opposition, he carried on and later became assistant superintendent of schools.

In 1871, upon the death of his wife, he resigned and went to Europe to study the science of education and find a better way for conducting school, as he was dissatisfied with the method then in use. After several years of study in Germany and elsewhere he returned to the United States and became superintendent of schools at Quincy, Massachusetts.

The Quincy System

Here he discarded old forms and experimented with new methods, based on what he had learned from his past experience and from study. He was considered a "faddist," and although he met opposition, he also received sympathetic support not only in Quincy but in other places where his work attracted attention. In 1900 (Col. Parker was then head of the Cook County Normal School in Illinois), Quincy celebrated the 25th anniversary of the advent of Col. Parker's ideas in their schools. Of this occasion Dr. Dewey later said: "Did you ever hear of a man, who starting as superintendent of country schools had reached a point in his career twenty-five years later when the anniversary of that beginning was an event to be marked by the educators of a nation? Of course he came at a time when routine work, the grading of schools, and the machinery of teaching had been the absorbing task for years, so much so that the individuality of the child had practically dropped out of the reckoning. This sort of thing had reached a climax when Col. Parker began to explode his ideas. The plans he introduced are an old story now in schools all over the country but — his aggressive methods roused the educational world as it had not been roused since Horace Mann had stirred up the schools of Massachusetts forty years earlier."

At this same celebration, Col. Parker himself stated about his work at Quincy that he "had great faith in free government brought about by educating into freedom through self-activity." He set out to break the shackles of formal tradition which bound the freedom of teachers and pupils alike. "Method," he said, "— routinish — fixed and finished — efficient — a panacea — a patent medicine. Method in this sense is the common and awful delusion of the present day. With the artist-teacher, method is the way he or she reaches an ideal. Therefore, method is entirely personal, ever changing, ever improving." He also stated: "There never was 'a Quincy Method' or a 'Quincy System' unless we agree to call the Quincy method a spirit of study and the Quincy system one of everlasting change."

COL. FRANCIS W. PARKER

It must have been with a feeling of satisfaction that Col. Parker returned from this celebration to Chicago where he was then at work. Here he had an opportunity to influence the teaching in a larger community. His work was attracting teachers not only from all parts of the United States but from foreign countries as well. G. Stanley Hall said of him: "I come here every year to set my educational watch." Nicholas Murray Butler considered Col. Parker's conception of the function of the school "as lofty an ideal as has ever been conceived by the human mind." The reputation of his school had spread far beyond the boundaries of the community which it was set up to serve.

While at the Cook County Normal School, Col. Parker, as stated before, had a great influence in reforming and reshaping the educational practice of elementary schools throughout the country. The summer institutes which he conducted were lively forums of discussions and he was in great demand at Chatauquas and teachers' institutes. His dynamic teaching and the magnetism of his personality was felt by every teacher with whom he came in contact. As one of his closest coworkers, W. S. Jackson has said: "Col. Parker declined to accept a creed handed down from the past, and therefore he refused to impose a creed upon his followers, or even to suggest a watchword under which disciples in the future might assemble. He has given us no fixed definition of education, but he formulated many definitions as he grew. As has been stated, he left few books and most of these he outlived."

Characteristically, however, as is so often the case, Col. Parker met with opposition at home while receiving applause far afield. The normal school became a part of the public school system of Chicago. Politicians impeded his work. Each year he renewed the fight for his ideals. His re-election, never assured, was won by a mere margin of one or two votes, influenced often by the packed gallery of Englewood citizens whose children were the best testimony of the value of Col. Parker's methods. Mrs. Emmons Blaine, a woman of vision, interested in the welfare of the children of Chicago, became a member of the school board. In sympathy with Col. Parker's work and wishing to make better conditions for furthering his ideals, she planned to establish an independent normal school where these ideals could be developed unhampered by political bickering. She purchased a city block on the north side of Chicago. Plans were drawn and material was ready to erect buildings for the "Chicago Institute," as it was to be called. Temporary quarters were secured and classes were begun. At this same time, President Harper was energetically expanding the University of Chicago into a great institution. Learning of the plans for the Chicago Institute, he approached Mrs. Blaine and Col. Parker and persuaded them to make their school a part of the university. So drawings were revised, Emmons Blaine Hall was built and Col. Parker became the first director of the School of Education at the University of Chicago. People on the north side viewed this move with regret. Their children had attended the practice school connected with the institute and were enthused with the results. They asked that this school be continued. So a building was erected on the original plot. This school given Col. Parker's name, has carried out the aims of the original founder to this day under the leadership of one of Col. Parker's most gifted followers, Miss Flora J. Cooke, who retired three years ago. Raymond W. Osborne is now the principal of the school.

With the establishing of the School of Education, Col. Parker looked forward to years of further service to the schools in a still wider field. But this was not to be. He had hardly been installed and organized his faculty at the university when death came in the spring of 1902.

Col. Parker and the Industrial Arts

"Without chart or compass we established a manual-training department. In September, 1883, a few rough carpenter's benches were put in a basement room and tools bought. . . . Manual Training became interwoven with all other subjects of study."

This date establishes Col. Parker as one of the pioneers in introducing shopwork

for pupils of the elementary grades. His boyhood experiences on the rough New Hampshire farm and his later studies and experiences in education firmly convinced him that an activity program was essential to the best education of a normal boy and girl. He further stated about his work: "Every graduate of the grammar school was able to do good cabinet work. This, however, was a slight indication of what handwork had done for them, muscles developed and co-ordinated, nerves stronger and steadier, minds disciplined and hearts made happy through the feeling of usefulness. It is notable that the foremost workers in sloyd were foremost in all other work."

Pick out the significant words in the above statements: "interwoven subjects," "do good work," "muscles developed," "minds disciplined," "hearts happy," "usefulness." There is much food for thought in these phrases. Have we kept faith with the early pioneers who fought for their beliefs and faced the charge of being called "faddists"? Have industrial-arts teachers been alive to their opportunities and lived up to their ideals, or have they succumbed to the easy way of standardized curriculum and the stereotyped method?

In some of our schools, the industrial arts have been in a rut for many years. Visit these shops and you will find a listless following of routine "models." The shops, busy hives of useful activity when the work was first introduced, are far from showing either mental or physical activity. To again quote Col. Parker: "I said it yesterday, I shall say it today and tomorrow. There never was a lazy child born in God's busy world. Oh, yes, you are lazy *now*. I understand that but that came after you were educated. Every child wants to do something. They put out their little hands and cry 'Give me something to do.' . . . Wasted energy is sin. Every child is a born worker."

Are shop teachers aware of the mental attitude of their pupils while in the shop? A teacher may have no trouble with discipline, the boy is busy, therefore the shop is functioning. But has he analyzed the situation? Is he assuming credit for his work where credit is not due? Perhaps his young charges have accepted the work he has planned for them because it is a relaxation from the more stringent routine of the academic classroom and the shop teacher has captured only half of the child — the restless physical side.

To put the whole boy to work, there must be more mental activity in our shops. In many places where the industrial-arts shops were closed by the economy wave, they would have held their own if the results for an educational point of view had justified the time and expense which the community had invested in shop, teacher, and pupil. The factors in the community whose judgment so frequently threw the balance against the shopwork were the parent, business and industry, and the superintendent of schools. With a united front, these factors could have overruled a school board with an economy complex.

In a world filled with gadgets produced by the machine at a trifling cost, some shop teachers still cling to wooden coat hangers when closets are filled with better ones made of wood and wire. You will still find salt boxes being made in school shops while industry packages the product in moisture-proof containers with patent pouring spout. Stainless steel and silver knives have no doubt eliminated the old scouring box as a model in most places, but the taboret is still with us. One father reported the attic filled with identical models — three boys in the family. "Wasted energy is sin," said Col. Parker, "every child is a born worker." Perhaps the boy sees his energy wasted in imitating the factory-produced gadget of the "five and ten" while the teacher is blissfully unconcerned, or seeking the easiest way to teach his "subject."

In a world demanding adaptability, business and industry have condemned the industrial arts at times because, especially in the elementary school, skill in hand-tool processes has been the aim and ideal. Committees of teachers have been at work on "standards." Reports of these committees vary but slightly from the minute subdivision and skills and techniques which the early sloyd courses emphasized forty years ago. Instead of narrowing our view by extreme concern with techniques the industrial arts should send the boys out from the school with an alert understanding of the principal factors of business and industry which he will meet.

In a world demanding intelligence, the superintendent has often been loathe to rise to the defense of the shopwork when under fire, because he knows it has failed to pull its weight in the educational boat. Only by being so vital a part of the school life as to be indispensable can industrial arts holds its own. Too often has the shopwork been a thing apart from the rest of the school. Of his own school, Col. Parker said: "Each teacher was expected to penetrate and permeate the whole faculty and the whole school with the intrinsic value of his subject and its relation to all other subjects, and to discover in what manner his specialty might enhance the value of the rest of the work." This brought a unity to the child's experiences. In many cases the industrial-arts teacher has been *in* but not *a part* of the school.

The School a Community

Col. Parker's conception of the school as a community in which the pupils *lived* was emphasized over and over again. At the meeting of the N.E.A. in 1895, he said: "The only way to educate a human being is to set him to work for others. . . . The child is not in school to gain knowledge. He is there to live and put his life into the community in which he lives. This is the future of education. We must abandon the quantity view, the knowledge view and remember that the society of tomorrow is the school of today. We can only make the society good, the state good, as we make these little communities of children love each other, and put their work in each other's lives and so the world will move forward."

This view of the school as a living, throbbing community, permeated all of Col. Parker's thinking. How vital a part of such a community cannot the industrial arts become if the "quantity" view is abandoned, if the spirit of community usefulness is substituted for the spirit of selfish acquisition. Every child is a lover of humanity. "There never was such a thing as a selfish child," said Col. Parker, "they grow selfish later. The little child puts out its tendrils and winds them around the hearts of all that are near. He loves everybody." What vast opportunity for social service and development of citizenship lie latent in the industrial-arts shop. Col. Parker carried Froebel's precept "let us live with our children" into every nook and cranny of the school activity.

If teacher-training institutions are more concerned with developing *the spirit of true teaching* in their pupils and less with quantity and skill in hand-tool processes, the quality of our industrial-arts work will improve. Too often pupils are graduated versatile in whatever may be the vogue of the moment whether it be "guidance," "trends," elaborate systems of "tests" or what not. Rather should these teachers be given the proper spirit and insight into child nature and then such a teacher may well be permitted to develop his own methods and course. On this point Col. Parker said "method should never be prescribed; each teacher should have freedom of choice, to work independently, aided by tactful suggestions and directions. A competent teacher is one who incites his pupils to work out their own salvation."

If industrial-arts work were carried out in such a spirit it would be a thriving red-blooded part of the school community. We have seen such work. On the other hand, lack of the proper kind of supervision in the case of one of our largest cities was one of the contributing factors in closing up all of the industrial-arts shops in the elemen-

tary schools. Col. Parker's method of supervision and guidance is best told in his own words when he described his work in improving the teaching in Quincy, Mass. He said he "taught in every class over and over again not by any means because he was a model but because he wished to learn to teach. It was exhilarating, delightful work though filled with errors and doubts, crude, unformed, experimental, but withal progressive." Such a spirit in supervisors toward improving the teacher in service would make for freedom and progress on the part of the teacher. At one time in discussing this freedom for teachers, he said: "Yes. Give teachers freedom to choose what they please. Poor teachers will cut their own throats with freedom; good ones will save themselves. Throw all responsibility of action on the teachers themselves." As a safeguard to this policy, he says again that the teacher should "be a child with the child and see how it grows and grow with it."

Col. Parker had unbounded faith in the public schools as the cradle of democracy. To quote: "I have said that the common school is the infant republic, because in the common school all castes, all classes, shades and beliefs, meet and learn to love and to live for each other."

For the public schools he said: "Policy demands the very best that the state affords. Three fourths of the pupils in large cities leave school before beginning the fifth grade (1894); the cry is that we must adapt the course to this sad condition. The mass of children do not leave school on account of poverty; they leave because the street, the shop, and the manufactory are more attractive than the school. If children loved school work, most parents would work their fingers to the bone to keep them there."

Col. Parker's life, it may be said, was spent in up-grading the public school so that it might fulfill the high purpose which he conceived for it.

Teaching Related Information

George K. Wells

Hammond, Indiana

Related information must not only be made part of trade instruction, but it must also be kept up to date.

There has been considerable discussion during the past years regarding courses for related information for the trades. In the day trade school they are found under such designations as science, mathematics, English, and drafting. The content of the courses has been as varied as their designations. There are those who so far as the teaching was concerned, confined the work to a standardized course in mathematics, or a similar course in science. One state supervisor found a course in algebra, taught in the conventional way, offered as a related-information course. In another city the work was left to the physics instructor, who at least connected his physics experiments with the machines and tools in the shop. In other places the work consisted of reading material about the trade and was credited as English for high-school graduation.

Such varied interpretations arise from the newness of the subject and the lack of background from which to view the whole problem. As the work has developed from the experimental stage a body of content material has been gathered which makes it easier for the administrator and teacher to properly organize and place such courses.

If the term *related information* is broadly interpreted it might include any information which would help a boy to be a better workman. In the narrower sense it could be interpreted as information needed by the worker in order to work at his trade in an intelligent manner. This latter interpretation has been the one used by the Federal Board for Vocational Education.

When the various trades are analyzed carefully it immediately becomes apparent that no two trades require the same knowledge content although there are many so-called fundamentals that apply to many trades. It is also apparent that as industrial processes change the practice of the trade, the content of related-information courses must also be modified. Often these modifications come so rapidly that the outline of the course should be altered even oftener than once a year. How then shall we go about planning and organizing such courses?

Some instructors have adopted textbooks containing information about the trades; shop-mathematics texts, applied-mechanics texts, and books about the trade or books about the materials of industry. They have then followed these texts faithfully, even if many of the problems have no connection with the trade being learned by the student. The book on applied mechanics was used in science, and the materials of industry in the English course. Clearly such a procedure leaves out the thought that the student's interest and desire for knowledge is centered about the shop or trade that he is learning. He cannot see the value of problems and information that do not apply to his trade.

It would seem much better practice to start with an analysis of the trade and to select from this analysis such material as can be classified as knowledge rather than skill. This material can then be organized and the teaching aids, books, pamphlets catalogs, charts, samples and the like, gathered from whatever source possible in order to provide the equipment for teaching. Textbooks on fundamentals should be available but no text can be kept up to date in such work for any length of time.

In order to illustrate this, attention is called to the wide variety of metal alloys now in use which have been and are still being developed. Information in textbook form on many of them is not available. The teacher must depend upon the literature from manufacturers or from articles in trade magazines, if he is to present this information to the students. To have textbooks that are up to date about the automobile would require textual revision each year, and even then, the books would be partially obsolete before they got into the hands of the student. It should be reiterated that fundamentals do not change rapidly and can be found in the text form, although such books must be supplemented with other material. If a course in related information needs to be changed frequently and must be different for each trade, then the course must be organized in such a way that it can be fitted to a variety of pupil demands and can be easily changed to keep up with changing technological requirements.

The individual instruction method seems to fill these requirements better than any other method. With this plan, instruction units or job sheets are prepared to cover the work to be given. A set of sheets must be prepared for each trade. These assignments may refer the learner to texts, booklets, magazines, catalogs, charts or any other material which contains the needed information. If any new material or practice appears in the trade, a new job sheet can be added; and, as certain practices become obsolete, the job sheets containing this information can be dropped out.

A further desirable convenience of such a method lies in the fact that in the shop

the student may need certain information in order to properly do a job. The job sheet referring to such knowledge can be secured and the knowledge gained, even if the information is not the next in order according to the usual procedure.

During the past year or two, for instance, the old designations, U.S.S. Thds. and S.A.E. Thds., previously used on shop drawings have been changed to N.C. Thds. and N.F. Thds. It has also been recommended to leave all inch marks from shop drawings. Such changes must immediately be adopted and placed in the instructional material which goes to the student. The person who is to make drawings, and the person who is to read drawings, should and must know of these changes.

The question of who shall be called on to teach the related information is an important one. It has been debated ever since vocational education began to be offered in an organized manner. Many contend that the shop teacher is the only person who can properly know what he expects his students to know in the way of information. Others contend that a man with engineering training would be a better person to handle such work. Still others contend that the mathematics teacher should handle the mathematics, the science teacher the science, and the English teacher the English.

There are excellent arguments for and against all of these plans. The shop teacher while he may know the trade may not understand the best method for teaching science or mathematics. The teacher trained in engineering may not understand shop practice well enough to see the proper way to connect the information with the skills. The teacher of science or English may or may not be able to make the application of the knowledge in terms of trade practice. No argument for or against any one of these plans should fail to recognize the fact that all people are more or less limited in their capacity. If their training has been excellent in one field it must have been at the expense of time that could not be used to learn facts in other fields.

One plan which seems to work successfully is for the teacher of the trade to make an analysis of all the knowledge which he wishes taught, and then, in a group conference with the English, mathematics, science and other course teachers, agree as to which one of them shall teach the information. It is quite possible that two or more teachers should teach about the same knowledge in different courses but with special emphasis on the scientific, mathematical or drafting content of the knowledge. Repetition is often necessary in education.

Whenever such an analysis is made it immediately appears that there is a body of facts or knowledge content which does not fall logically into science, mathematics or other standard groups. Such material is handed to the so-called *related-subjects teacher*. If at any time new information needs to be taught in order to keep up with the changes in the trade, such information can be given to the instructor of the course where it seems to fit best. The instructor of mathematics may figure the comparative weights of new alloys while the science teacher is stressing their tensile strength and the related-subjects teacher is dealing with the knowledge of its uses in industry and whether or not it must be heat treated.

The individual instruction method is very flexible. Under it provision can be made for the work of the retarded pupil and the brilliant student. It is always possible to change certain parts of the course quickly and effectively. The sources from which the information comes may be widely scattered.

No matter how we organize, whether the work is taught by the shop teacher or someone else, it is highly desirable to carefully analyze the trade, group the information into the most desirable teaching form and then to remember that, in order to keep up with technological changes, it must constantly be rewritten.

Eyes Right!

John E. Crawford

Perry High School,
Pittsburgh, Pennsylvania

Every teacher should make some kind of survey of his students' eyes and sight early in the school term in order to help eliminate faulty vision and its reactions on attitude, study, work, and health.

Our eyes are in many ways the most wonderful servants of the brain. Through our eyes we gain all the myriad of impressions the sense of sight alone can awaken. For example, in reading the description of a machine, we can somehow sense its roar of wheels, its radiated heat, or the magnificent ease with which it functions. Viewing a moving picture of a machine adds even more to the complete illusion of reality which comes to us over the retina. To the musician, the notes before him take on a sense of harmony, through his eyes. Our eyes seem to be the most wonderful organs we have, yet how do we treat them? And how about our students' eyes — are we as aware as we should be of defective sight among them?

This article is an attempt to set down briefly the common defects of eyes, with the hope that when the teacher recognizes these conditions as present, he will do something about correcting them. In no sense is this article meant to displace the regular scientific orthoptic analysis. On the other hand, the teacher can be of great help to the student if he can prove to the boy how seriously he will be handicapped if an existing eye defect is not sensibly checked up and remedied by a competent optometrist.

The Anatomy of the Eye

So highly complex is the eye that many volumes have been written on its anatomy, and about organic peculiarities growing out of its anatomical peculiarities or defects. So in this small space we mention but briefly the main parts of the eye.

Examination shows the eye to be a marvelously constructed little "camera." But the eye can far outdo the camera in perception of such factors as depth of focus, color, and ranges of light down to nearly jet black or no light at all. And the eye automatically adjusts itself, or accommodates itself, to our needs of vision. Have you ever looked far into the sky in search of a distant plane? Remember the peculiar, half-conscious feeling of the lens accommodating its focus from very far to near and then to far distances again, looking for the expected plane? And all without our direct conscious control of focus, too.

Because cameras are so common to us all, we might compare (roughly, of course) the parts of the eye and camera, with emphasis on the use of the part rather than on its construction. Naturally, the camera has no automatic focusing control system, nor does the eye have the inherent advantages or disadvantages of a rigid and unchanging crown glass lens, steel shutter, and metal box.

But there are many points of fair comparison between the two:

The Eye	compared with	*The Camera*
lids		lens dust cap
cornea		front lens or window

pupil, or opening on the inside	aperture or "stop" hole
(none needed)	shutter
main lens	rear lens
chamber, filled with vitreous humor	box or bellows, air filled
retina, with its rods and cones	photographic film
optic nerve to brain	(television's forerunner?)

The eyes also have a system of muscles which automatically turn and focus them as a pair of cameras, capable of perceiving depth through their stereoscopic relation. Hence our eyes can see the third dimension, while a camera can get only the two of length and width on a plane surface.

Minor injuries to the eye are overcome through its very efficient lubrication and intricate blood system, affording rapid repair and healthy state, even while they are in almost constant use during the time. Our eyes can withstand great ranges of atmospheric conditions and temperatures, and seldom become infected by germs which attack the rest of our bodies.

Defects of the Human Eye

Our sight is made up of a combination of three subsenses, namely, sense of light, sense of form, and sense of color. The light sense enables us to perceive the varying intensities of light, the form sense conveys information about size and shape, and color sense distinguishes color values.

Any defect of the eye which prevents normal sensitiveness to light, form, and color will prevent the person from seeing what normal-sighted folks see. But for some strange reason, boys and girls dislike very much the idea that their own eyes do not see normally; they will often take unfair criticism of their mental caliber about poor work caused by faulty vision, rather than admit the truth about their sight defect.

Recent surveys indicate that about 75 per cent of our eighth graders have seriously defective vision, with only about one third of these cases adequately corrected with properly fitted glasses or exercises. This leaves about 50 per cent of our eighth graders with impaired vision. High-school checks show about the same percentages.

Schoolwork, for many children, is the hardest kind of visual work they will ever have to do. To detect and thereby direct toward proper care these defects, however slight, and to teach boys and girls to use their eyes to their best advantage, will be the most important work toward the elimination of blindness. Eye defects most commonly arise from:

1. Severe overuse and strain, such as caused by exceedingly close or constant work, under poor light, with no rest periods.
2. Physical injury to the eye itself, such as from flying emery particles or lathe chips in a shop.
3. Use of detoning drugs and alcohol, as in intoxication.
4. Degeneration caused by general physical illness.
5. Infection causing cancer or cataract on the lens. Because of the very nature of the eye, we can seldom undo or overcome the effects of severe misuse or injury. Any loss of the chamber vitreous humor causes inevitable blindness. Scars on the cornea or "front window" also result in near blindness. And alcoholics usually suffer from capillary dilation that eventually dulls sight.

Physical or nervous deformity of the eye parts causes most of us to have one or more of these common defects:

1. Myopia (or near-sightedness), where only near objects can be clearly focused.
2. Hyperopia (or far-sightedness), where only distant objects can be clearly focused.
3. Astigmatism, where the same line cannot be equally well focused when turned at other angles.
4. Color blindness, or lack of correct color sense, even to the point where red may seem the same as green.
5. Unbalance, where both eyes do not register exactly the same or do not equally share the burden.

When any of these defects is present in great enough degree, our eyes' acuity (sharpness of image or focus) and accommodation (ability to focus rapidly and accurately) is at stake. Some of us can still remember the severe headaches — and heartaches too — caused by trying to study and work when we could hardly see what we were doing. When we consider that about half of the boys and girls in our classes today are under such handicaps, it seems quite pertinent to point out some tests which will detect these defects and make both teacher and child conscious enough about the condition to take remedial measures in time to save the eyes from further injury and continued misuse.

Eye Tests

There are some relatively simple tests which can be made by any class, with the teacher's guidance, which will give each student positive proof of the presence of any of these commoner defects listed before. The drafting department and printshop can be a real benefactor to the whole school, by lending a helping hand in the job of making up some cards similar to the one shown in Figure 1. Enough cards to have one in the hands of every student in a class, makes it possible for the teacher to direct their use in the simple eye tests using the cards as targets and blinds. Boys and girls will respond honestly to a simple test of this sort, if given a mimeographed or printed "Eye Check Card" similar to the one included in this article. The school printshop can advertise its ideals through this project.

The tests themselves are easily managed in a group, so long as the room is fairly well lighted for everybody. No lengthy introduction is necessary, just a few remarks about the value of our most sensitive organs, the eyes, and how we can readily discover whether or not we should visit the

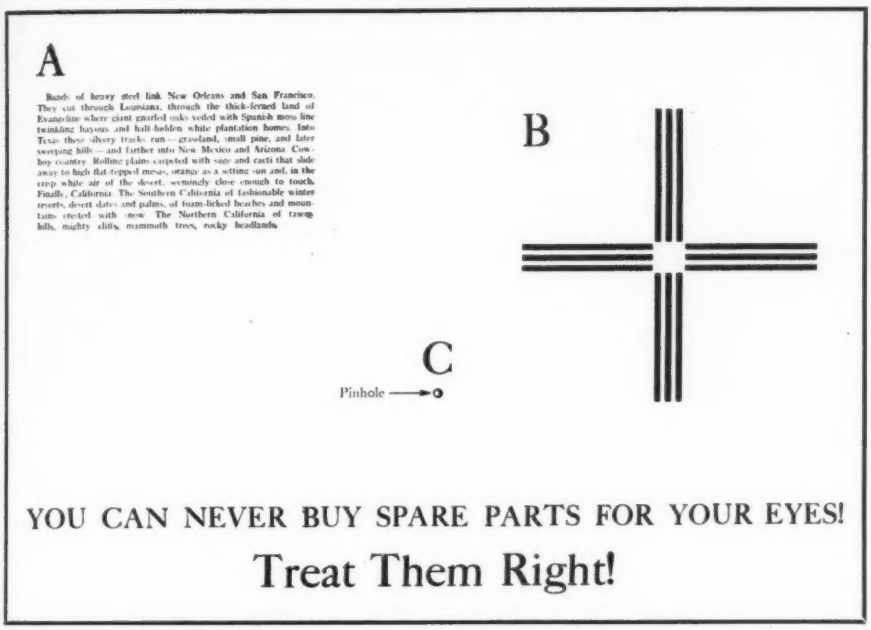
A
Bands of heavy steel link New Orleans and San Francisco. They cut through Louisiana, through the thick-ferned land of Evangeline where giant gnarled oaks veiled with Spanish moss line twinkling bayous and half-hidden white plantation homes. Into Texas these silvery tracks run — grassland, small pine, and later sweeping hills — and farther into New Mexico and Arizona. Cowboy country. Rolling plains carpeted with sage and cacti that slide away to high flat-topped mesas, orange as a setting sun and, in the crisp white air of the desert, seemingly close enough to touch. Finally, California. The Southern California of fashionable winter resorts, desert dates and palms, of foam-licked beaches and mountains crested with snow. The Northern California of tawny hills, mighty cliffs, mammoth trees, rocky headlands.
B
C
Pinhole
YOU CAN NEVER BUY SPARE PARTS FOR YOUR EYES!
Treat Them Right!

Fig. 1. Smooth-reading paragraph in 4-point type. Card 4 by 6 in.

optometrist for treatment or glasses. Explanation of the test series might be made as follows:

1. Reading test, to show up faulty accommodation and acuity.

Hold the card shown in Figure 1 about 18 in. from the eyes, in good light. Read the paragraph under 1. Note if the letters or words tend to blur out at A. Answer question number 1 on the check card. See Figure 2.

2. Astigmatism test, to show whether sight is uniformly good at all angles.

Hold the card (Fig. 1) about 18 in. away from the eyes, in good light. Look at the lines at B. Do vertical and horizontal sets of lines seem equally black? Note any difference, and answer question 2 on the check card.

3. Myopia-hyperopia test, to show up near-sightedness or far-sightedness. (The card, Fig. 1, should have a pinhole at C.)

Focus your eyes on a distant object, through the window. Cover one eye with your hand — *do not squint*. Is the object still clear to you as before? Now, try looking with this eye at the object through the pinhole at 3, with the card held near your eye. Does the pinhole help this eye to see the distant object more clearly? Repeat for the other eye, and check item 3 on the list in Figure 2.

4. Balance test, to check co-ordination of the eyes.

Focus the eyes on the small reading paragraph at A in Figure 1, with the card, held 18 in. away. Now, cover the left eye with the hand — *do not squint*. Can you feel the right eye change its direction or focus even slightly, when you cover the left eye? Repeat for the other eye. Record your findings under item 4, Figure 2.

5. Color and light test, to check on color blindness and quality of light perception.

Think carefully over your experiences in seeing color, choosing or matching colors, etc. Then answer item 5 to the best of your knowledge about yourself.

6. Strain test, to record noticeable effects of strain.

Record under item 6 your own experiences.

Explanation of Tests

1. *Reading Test.* Normal healthy eyes or correctly lens-fitted eyes should be well able to read 2-point type, double spaced at 15 to 18 in. from the eyes, in good light. But most school printshops do not have 2-point type in their cases, hence the suggested use of a smooth-reading paragraph, set in sharp, black 4-point type, single spaced. If the person can read this 4-point type without noticing any strain or blur, at 18 in. from the eyes, his eyes have fairly good reading vision. It is a good idea to check each eye separately on this 4-point type if blur or strain is noted when using both eyes. This technique will isolate the faulty eye of the pair.

2. *Astigmatism Test.* When eyes are right, they see the same lines equally well when the lines are turned through angles in a plane perpendicular to the line of vision. The vertical and horizontal lines of Figure 2 are identically set up and equally black. If either group appears slightly blurry or gray compared to the others, the person's eyes are astigmatic. This simply means that his eye lens is not truly spherical, but somewhat out of shape on one axis compared to other axes. The only corrective measure now known for astigmatism is the constant wearing of glasses ground especially to correct this axial aberration of the eye lens. It is well to check each eye separately, in severe cases. It is possible for eyes to appear normal or non-astigmatic as a pair, when in reality they may be equal and opposite in degree and angle of astigmatism, thereby tending to produce seemingly normal vision as a pair, yet both may be severely straining to do the task.

3. *Myopia-Hyperopia Test.* If the person can see distant objects clearly but near objects blur to his vision, his eyes have lost (or never had) the power to adapt their lens shapes to focus on near objects. His eyes are far-sighted, or hyperopic. This defect is easily detected in students. About 10 per cent of us have hyperopic vision, needing glasses for correction.

Myopia, or near-sightedness has much to do with the over-large pupillary opening in the iris of the eye, which does not permit the eyes to focus clearly on distant objects. The use of the pinhole in the card is a simple way to artificially diminish the active pupillary opening, bringing about better distance vision in myopic cases. When children squint their eyes to see, we can immediately suspect myopia to be present. Properly fitted glasses and a better balanced diet are the only correctives Known. Lack of butyric acids in the diet has been discovered to be a common cause of myopia in children. More play out of doors, where vision is seldom close, is also a sound bit of advice for myopia.

4. *Balance Test.* Eyes do not always want to work in a well-balanced pair, fairly sharing the burden of sight. This test will quickly discover the defaulting eye of the pair. An observer, watching the student's eyes as he carries out this test as directed, can readily notice any change in the one eye's focus adjustment, as the student covers his other eye with his hand. Faulty eye balance can produce nausea, in severe cases, showing how distasteful such a condition is to the visual centers of the brain. Glasses will bring about good balance.

EYE CHECK CARD

Name ..... Grade .... Report Room .... Age ....

Do you wear glasses now? (Yes or no) ..... ——

If so, when were eyes last checked? ..... ——

CHECK THESE ITEMS ABOUT YOUR EYES

1. Can you read the tiny paragraph with ease? ..... ——
   If you had trouble, did it blur slightly? ..... ——
   Did it blur badly? ..... ——
   Was is completely unreadable for you? ..... ——
2. Do the horizontal and vertical lines in B seem to be equally clear and black to you?.... ——
   If not, do the horizontal lines seem blacker? ..... ——
   Do the vertical lines seem blacker? ..... ——
3. Can you see distant objects clearly? ..... ——
   Does the pinhole help your left eye to see distant objects more clearly? ..... ——
   Does the pinhole aid your right eye? ..... ——
4. Does your right eye change slightly when you are looking at the card if you cover the left eye with your hand? DO NOT SQUINT. ..... ——
   Does your left eye change when the right is covered? ——
5. Can you always distinguish colors? ..... ——
   If not, do reds and greens seem alike? ..... ——
   Do blacks and blues seem alike? ..... ——
   Does black ever seem just gray? ..... ——
6. Do your eyes ever ache?.. ——
   Do you get headaches from reading? ..... ——

GOOD EYE HYGIENE—A HEALTHY BODY, A WELL-BALANCED DIET, STEADY NERVES, PLENTY OF REST, BEST OF LIGHT FOR WORK, NO STRAIN.

HEED NATURE'S WARNING! SAVE YOUR EYES! THEY ARE THE ONLY ONES YOU WILL EVER HAVE!

Fig. 2. The eye check card

5. *Color and Light Test.* Just what we all see, as individuals, compared to other people, will always be in doubt. What one artist sees as royal color, seems poor taste to some of us, and maybe it is all a matter of color blindness. In severe cases, children are quite unable to correctly match bits of yarn of various colors with colored chart boxes. Railroad engineers are frequently checked for color blindness. Specially prepared tinted glasses will help in average cases.

6. *Strain Test.* Severe eyestrain and general bodily state of health are closely related, we now know from careful check of case histories among children having much trouble from headache, faulty digestion, or nausea while reading. Reading in bed, on moving street cars, or in poor light, with abnormal body posture is known to bring severe eyestrain. Homework has cost many boys and girls much in the way of more defective sight.

Corrective Measures

The good teacher knows there is nothing unprofessional in his urging students with faulty vision to secure the services of competent eye specialists. He also realizes how valuable such data on students' vision will be to the office of the adviser and principal. We cannot afford to let our boys and girls drift into any stage of blindness.

There are on the market many sight-checking devices and tests, some of which may be of interest, and all of which will be found helpful. They are therefore listed here.

1. The Betts Tests, for visual readiness, visual sensation and perception. (Keystone View Company, Meadville, Pa.)
2. Telebinoculars, for making stereometric checks on all visual reactions. (Keystone View Company.)
3. Standard Snellen and E-Charts, for checking sight at 20 feet.
4. Standard Near Point Targets, for checking vision at reading distance.

The modern school is using some kind of check system on the eyes of its children. The eyes are the most sensitive organs we have in our bodies. The cost of good eye hygiene will always be cheap, compared with its far-reaching results. Let's have Eyes Right!

Educational Production in the School Print Shop

W. W. White
Central High School,
Fort Wayne, Indiana

Making production jobs function as instructional material.

There seem to be few high-school print shops that do no production printing, either through choice or compulsion. Still from many sources come complaints that production is the base of the school printery. It is the purpose of this article to suggest some methods that make production a blessing rather than a curse and a real educational process rather than child exploitation.

We are considering shops that have as their aim a general cultural and prevocational objective. The true vocational course should pursue an entirely different outline, especially in the second and third semesters of work.

The first thing necessary is to have a thorough understanding with all officials from whom orders for production work are to come. Any person can understand that jobs of any description, coming in at any time must seriously affect a systematic teaching process and knowing this could not refuse to co-operate with the printing teacher to such an extent as to carry out at least some of the plans which follow.

Officials or their secretaries should go over all the blanks and printed forms that are to be printed in the school print shop and determine the number that will be required for the coming year, furnish the instructor with samples, having all changes, if any, clearly indicated. With this data the teacher can choose those that best fit his course at the time the students are ready for that type of work.

This may cause some of the same old difficulty at the beginning, but after the system is under way for a semester, it should be easy for the printing instructor to keep the supply shelves of the different offices far enough ahead so that these orders will never come in as rush orders to be filled in a day or two. There will always be some work not anticipated, which will need to be done in a hurry, but these few jobs should not be such a menace as to upset the regular class instruction. Sometimes it is a good policy to allow a student to do a rush job after hours and pay him for this time, charging this to the job along with the other charges for stock, etc. Persons having to pay these extra charges are more likely to place orders more promptly the next time.

A little blotter with the text "If you wait until you want a printing job the *worst way,* that's the way you'll get it," placed in delivered packages of printed matter serves as a reminder that orders should be placed early.

Another plan advantageous to both student and teacher is the arrangement of the course of study so that there will always be a time in Printing IV or V where the student is no longer required to go through set lessons or classwork and is able to do most any kind of work necessary in the shop. These boys can take care of rush orders when the rest of the classes are doing classwork or shopwork, without interference either way. It is found best, however, to limit the groups doing such productive work as needs immediate attention, to three or four at the most.

Where boys are working alone in the shop, it is essential for the teacher to write his instructions for the period or the day, pointing out the exact amount and nature of the work to be accomplished. This saves time and puts the pupil on his initiative.

Another administrative plan that has been found to be of greatest help where production demands are apt to interfere with instruction, is to have all classwork at the beginning of the semester, occupying from two to three full weeks for intensive study of the matter to be taken up during the semester, using notebooks for diagrams, sketches, and notes, and covering each subject thoroughly. These notes are to be used later as the shopwork progresses and application of principles are made.

The job assignments are made for a period of five or six weeks. This means that each pupil, in the more advanced grades, is assigned to a specific phase of shopwork such as pressman, stoneman, etc., and these positions are held for a third of the semester's length, after which period the jobs are rotated. This length of rotation period will not allow all pupils to engage in all departments during one semester of work, but the results are so much more satisfactory in every way than the helter-skelter, week-on and week-off method which is used so frequently. The rapid rotation allows for no skill in any department and the resultant smattering leads many students to become disgusted with the course. A careful plan with accurate records of jobs assigned will give all students a chance in all departments in the course of two or three semesters, and if they are of the type that drop out during this interval, it is of

(Concluded on page 370)

INDUSTRIAL ARTS and VOCATIONAL EDUCATION
J. J. Metz, Editor

Taking Care of Their Eyes

In the article "Eyes Right!" by John E. Crawford, which appears on page 364 of this issue, attention is called to the need for carefully testing and guarding the eyesight of the students who come for instruction. Many of these children, unless their defective vision is discovered in school, will start adult life severely handicapped, because not only have they to battle with their defective sight, but they also must overcome the burden of nervousness, the feeling of thwarted effort, worry and fatigue, brought about by their eye defects. Every teacher, therefore, ought to make an effort to discover what the individual needs of his students with regard to eyesight, are and then assist them as much as possible to correct the defect and the damage that may already have been done.

With the strict regulations now established by many industrial firms for entry into employment, the chances for obtaining a worth-while job by the worker with poor eyesight are steadily getting worse. It is, therefore, necessary that all teachers, shop teachers especially, take an interest in the problem of relieving eyestrain in school by providing better lighting and proper teaching facilities, and by doing their utmost in assisting their students in preserving that precious gift — their eyesight.

Leonardo Da Vinci

Among the engineers of all times, Leonardo Da Vinci deserves to be ranked among the first. It is true, of course, that he is commonly known as a painter and as a sculptor, but he was such a versatile genius that he won fame in many fields. Not only was he one of the greatest among the painters and sculptors, but he was also noted as a mathematician and as a mechanical, civil, and military engineer. Besides this, he was a musician, anatomist, botanist, geologist, and astronomer.

He was born at Vinci, near Florence, Italy, in 1452. Even as a boy, he showed the remarkable gifts with which he was endowed. In his youth he was especially attracted toward drawing, modeling, and music. When he was about 15 years of age, his father placed him in the studio of Andrea del Verrocchio, who was a noted sculptor and painter in Florence, and an excellent worker in gold and other metals. In this studio, Leonardo worked until 1477, in company with other young artists, some of whom became more or less famous later on, but he surpassed them all, both as student and as independent worker after he and they had left Verrocchio's studio. As a matter of fact, when Leonardo had reached the age of 18, Verrocchio entrusted more and more of his work to this gifted student who even then showed that he was surpassing the master who taught him.

Leonardo was very thorough in his preparation for any piece of work that he attempted. He may even be credited for having been one of the first to apply the scientific method for he not only theorized about the things he studied, but tried out his findings as well. In this way, he laid down the method later followed by philosophers like Bacon and Galileo. His interests were very broad as is shown by the voluminous notes embellished with sketches, which he left at his death. Unfortunately, much of this material has been lost in the meantime, but the breadth of his field of study and research is really astounding. Toads, lizards, insects, birds, and animals are studied so that they can be embodied in his paintings and sculptures. The sun and moon and stars are observed. The flow of rivers is closely studied, mechanical devices are experimented with, chemical mixtures are made, and new coloring mediums are studied and applied.

At times, this spirit of study, analysis, and experimentation shows up very unfavorably in Leonardo's work. Several of his large undertakings were never finished because he became lost in the maze of detail which he deemed necessary for the completion of the work. This habit of procrastination became more noticeable as he became older. Thus, when the pope asked Leonardo during the latter's sojourn at Rome, to paint a picture, the great artist started, not at the picture, but at compounding a varnish of oil and herbs, to be used on the finished painting. The pope, on being informed of this, remarked, "Oh, he will do nothing! He thinks of the end before he has made a beginning."

Leonardo's greatest picture "The Last Supper" began to flake off the wall shortly after it was finished, largely because Da Vinci's lust for experimentation had misled him. His tireless work throughout life, however, made him realize the correct solution to many problems that continued to trouble other philosophers for centuries after.

He clearly understood that natural laws could be formulated mathematically, and that natural phenomena could be predicted and imitated if one but knew their causes, and could duplicate them. In this way, he discovered a number of truths later to be re-established by modern investigators. Thus he understood how to harness water power, grasped the nature of fossils, learned much about tree and plant growth, perceived the true history of the earth by his studies of rocks and rock formation, discovered the action of muscles and nerves through his anatomical dissections, studied the action of steam, formulated the principles of the propeller, and of the heavier-than-air flying machine.

Many of his notes were written in code. Besides this, they were written in an inverted form, and right to left. He used many symbols and abbreviations so that his writings often are difficult to decipher and translate. After his death, his notes became separated. The main parts of what is left are housed in the Ambrosian Library at Milan, at the library of the Institute at Paris, and at South Kensington, the British Museum, and at Windsor, in London. He is also known to have written a treatise on painting.

That he was fully cognizant of his own powers, may be seen from a letter written to Ludovico il Moro, then regent of the Duchy of Milan, in which Leonardo states his qualifications for the position for which he is applying in the following manner: "(1) I have a process for constructing very light, portable bridges, for the pursuit of the enemy; others more solid, which will resist fire and assault and may be easily set in place and taken to pieces. I also know ways of burning and destroying those of the enemy. . . . (4) I can also construct a very manageable piece of artillery which projects inflammable materials, causing great damage to the enemy and also great terror because of the smoke. . . . (8) Where the use of cannon is impracticable, I can replace them by catapults and engines for casting shafts with wonderful and hitherto unknown effect; briefly, whatever the circumstances I can

contrive countless methods of attack. (9) In the event of a naval battle I have numerous engines of great power both for attack and defence; vessels which are proof against the hottest fire, powder or steam. (10) In times of peace I believe that I can equal anyone in architecture, whether for the building of public or private monuments. I sculpture in marble, bronze, and terra cotta; in painting I can do what another can do, it matters not who he may be. Moreover I pledge myself to execute a bronze horse to the eternal memory of your father and the very illustrious House of Sforza, and if any of the above things seems impracticable or impossible I offer to give a test of it in your Excellency's park or in any other place pleasing to your lordship, to whom I commend myself in all humility."

He died at the age of 67 at the Chateau of Cloux, near Amboise, France, while making studies for rendering the river Loire navigable. A marble monument marks his grave near the Cathedral of Milan.

This genius may well be held up as an example to be copied by the students of industrial arts and vocational education. Not only was he proficient as a craftsman, but he was constantly interested in devising new ways for accomplishing results and in adapting new materials and mediums to old practices. Besides this, he believed that the artisan should have a thorough knowledge of the materials with which he worked. It was for this purpose that he studied nature, made scientific experiments, and spent much time in attaining proficiency at mathematics. He also knew the value of noting down the results of his studies, hence the voluminous notebooks which he left — truly an example to be set before our future professional men, artists, inventors, and industrial workers. A short study of his life, therefore, may well be expected of those who are taking up industrial arts and vocational education.

A Worth-While By-Product of Shop Training

Recently the American Humane Society held its convention in Milwaukee. One feature of the program was to pay special tribute to Henry Bergh, founder of the American Society for the Prevention of Cruelty to Animals. This man was the son of a wealthy New York banker. He studied law and was appointed secretary of the American legation in St. Petersburg, Russia, during Lincoln's administration. Here he observed the cruelty with which the Russian drivers treated their horses. This so affected him that he left his position and went to London, there to study the humane movement. He then returned to his native land and founded the American Society for the Prevention of Cruelty to Animals. The movement is now widely spread and deserves the co-operation of all.

The schools are in a position to do much good in this cause. They are doing fine work in spreading information on the forest-conservation movement. It is but a further step to preach the gospel of kindness to animals.

The young unconsciously acquire many cruel practices from their companions, and from ill-trained and thoughtless adults. It is well, therefore, for the teachers of our schools to look into and help spread the tenets laid down by Henry Bergh for the American Society for the Prevention of Cruelty to Animals, and thereby exert a very much worth-while influence on our American youth.

Safety, Safety, Safety

This issue of INDUSTRIAL ARTS AND VOCATIONAL EDUCATION brings an article on "Driving With Safety" by A. H. Vance. This is just one of the phases of safety in which the shop teacher is, and must be, interested if he is to do his work properly. The field of safety instruction is very wide, and it is necessary that the entire field be covered, at least to some extent, by instructional material in the school.

How great the need for safety instruction really is, may be gleaned from a study of the annual report made for the United States on this subject. According to statistics quoted in an article by Ivan A. Booker in the *Journal of the National Education Association*, there are annually about 100,000 accidental deaths, and 9,340,000 nonfatal injuries, out of which 360,000 are permanent disabilities. The monetary loss caused by these accidents has been estimated at $3,450,000,000. The appalling part is that the accident rate is increasing. It is time, then, that the individual, the home, the school, and industry, combine in reducing the suffering, the useless waste, and the other concomitants to major accidents.

For the shop teacher, of course, safe shop practices are the first consideration. These, however, must be made to carry beyond the school-shop walls. It is not enough, for instance, to make the tool-storage board in the school shop safe and thus prevent the student from being injured unless he also is definitely instructed how to store his own tools at home as efficiently and safely as they are at school.

It is not sufficient to lay down strict rules as to what the worker is to wear for certain jobs, if the reasons are not made clear to the boy just why he is asked to dress that way.

It also will not suffice to thoroughly guard all school machines, and then let the boy operate unguarded machines at home without having a thorough understanding of the dangers he may encounter and the extra precautions he is to take.

Just as every shop operation has its hazards, so practically every other activity has its potential accident possibilities. When the boys are permitted to make certain projects for their own use in the school shop, it is necessary that they also be cautioned as to the dangers that accompany the use of such articles. A boy who can't swim has no business building a canoe, or any type of boat to be used on deep water. The building of man-flown gliders in the high-school shop is to be discouraged. Even the building of such articles as kites, sleds, toboggans, skis, model gliders, model airplanes, and model boats, should be accompanied by safety lessons which call attention to the need of care so as to avoid serious smashups, broken limbs, drownings, and electrocutions.

It is necessary, therefore, that shop teachers assume their share of the burden in making our country safe, and our workers safety conscious. This means a careful analysis of not only the accident risks connected with the use of the tools, machines, and materials met with in the school shop, but also with those inherent in the articles produced by the student. It is only when safety practices have become a recognizable outcome of shop instruction that the school-shop program is actually functioning as it should.

The boy who has taken work in the school shop without having learned to work safely and the need to think safely at all times, has failed to acquire a very important phase of shopwork.

Educational Production in the School Printshop

(Concluded from page 365)

slight consequence as it shows a lack of interest in the subject.

It should be clear from the foregoing that classwork is to precede all shopwork of like nature, and this instructional work is done in a room with seats or armchairs apart from the shop. However, it is possible to use the shop for classroom work by bringing in the chairs and when this latter is done it is imperative that all the classwork be done at the beginning of the semester. Another advantage possessed by this plan, is that the boys who have the ability, may be permitted to go ahead as fast as they wish without having the less brilliant members hinder their progress.

When pupils enter the class late in the term, job sheets must be the instructional medium. Job sheets also may be used with the entire class if desired.

Another factor which reduces the production evil to a minimum is the systematic routing of all jobs through the shop. This means, that accurate yet simple records of all jobs assigned, when assigned, and when they should be completed, must be kept.

Metal Spinning and Its Origin

Harry M. Dexter

Central High School,
Grand Rapids, Michigan

An expert at metal spinning tells the beginner what must be done to do the work safely and well.

Tracing the history of metal, its uses and methods of working, makes a very interesting study. Metal was undoubtedly used long before the Israelites traveled through the Sahara Desert on their way to the Promised Land, but inasmuch as the early records of its use and methods of preparation have been lost, its history can be traced only to the account of the building of the Tabernacle as recorded in the Old Testament (Exodus, Chap. 25). This chapter of the Bible contains many references to the use of gold, silver, and brass, and even gives directions how the metals are to be used in the construction of some of the articles.

Early Methods of Working Metals

It is quite worthy of mention, that even at this early time, metal chasing and repoussé work had been done. This is mentioned in the making of the Cherubim of pure gold. Of course, articles made of metal were used long before the building of the Tabernacle. For example, we find mentioned in the Bible that when Joseph was dictator of Egypt, he was in possession of gold drinking cups. The methods used in making these cups are not given, however. It is only at the building of the Tabernacle that methods of work are described. The candlesticks, for instance, are to be made by the method of *Miksha* (Hebrew), which means hammering. It is evident that molding or casting was also used, as the Hebrew word *Masecha* means melting or molding.

While the early history of the use of metals of all sorts is shrouded in darkness, one thing that is certain is that the shaping of metal was done by hand, with the aid of a very limited number of crude hand tools. In those ancient times, these methods of work were satisfactory because the demand for metal articles was very small. Only the more fortunate could afford such luxuries as iron pots and pans for cooking and baking. The majority of people at that time were happy if they possessed clay or wooden dishes for their primitive household uses. Later, as the population became more dense, and man became more adept in the working of metals, the demand for metal utensils increased, and accordingly the number of artisans who occupied themselves with the manufacture of such metal articles also increased. This demand induced the artisan to search for new methods to speed up daily production, and jigs, tools and forms to aid the metal worker were invented. These were improved, further developed, and added to as time went on, so that metal goods could be produced faster, cheaper, and in greater volume.

The Stamping Process

Among the newer methods which thus came into vogue and which became very popular, was the stamping out of metal utensils on presses. This method, however, was useful only in the production of great numbers of metal articles, as the cost involved in making dies for stamping was too great for producing only limited quantities. The question then arose, if but a few hundred round metal utensils are to be shaped, can they not be produced by some other method than by hand or by the stamping-out process? The answer was *metal spinning*. It is impossible to determine to whom credit must be given for inventing this wonderful process. Probably it was the potter who may have got the idea of shaping metal on a wheel just as he molded and shaped his clay. Or it may have been a sheet-metal worker hammering away on a piece of metal while drawing it up over a suitable stake, who may suddenly have got the idea of attaching his metal to a turning lathe, so that instead of turning it by hand, the work would be done mainly by the machine. But, be that as it may, metal spinning is not only a very useful method in shaping metal articles, but it is also very interesting.

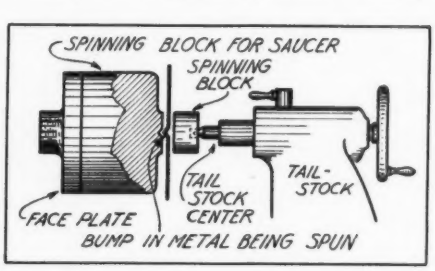

Fig. 1. Setup for spinning a saucer

SPINNING

As in all trades or professions, the metal spinner must start at the bottom and climb upward to become a real artisan. Probably the first thing to emphasize with the beginner is the safety precautions which he must observe lest he be severely injured. Among these safety precautions are the following: (1) Do not run the lathe too fast when spinning large articles. Between 900 and 1,100 revolutions per minute is just about right. (2) See that the piece of metal to be spun is quite round and accurately centered. (3) The metal must be pressed tightly to the spinning block or else it will fly out and cause a severe injury to the worker or to bystanders. (4) Be sure that the spinning block is sound and free from cracks, and that it is fastened securely to the headstock of the lathe. (5) See to it that the tailstock is firmly clamped down, for if it should move, the metal disk may fly out. (6) Roll up shirt sleeves and remove neckties while spinning metal. (7) Whenever possible, it is well to raise a small bump at the center of the metal. This can be done with a rather dull center punch while the metal disk is resting on a piece of wood or lead. This small

center bump is to be placed into the little depression in the center of the spinning block, as shown in Figure 1. Its purpose is to keep the metal in place so it will not fly out of the lathe while it is being spun.

Spinning a Saucer

The first project chosen for explaining the actual work of spinning, is a simple saucer. The metal for this article should be cut about an inch larger than the desired diameter of the finished product. After having observed all the safety precautions mentioned before, place the metal against the spinning block so that the bump in the center will be in the center of the depression in the block. Procure a piece of iron or brass about 2 in. in diameter and about ¾ in. thick. In one face of it, drill or bore a 5/16-in. hole. Place this piece, or plug, with its bored end toward the center of the tailstock, then turn the tailstock screw until the plug, the spinning metal and the spinning block are all clamped together. Next, place the tool rest in a convenient position. This requires judgment which can be acquired only by actual experience. When everything is properly set, grease about 3 in. of the end of the drawing-up spinning tool with beef or mutton tallow. Lay the end of the tool on the tool rest to the left of the tool-rest pin, and place the handle of the spinning tool under the right armpit. Then, starting near the plug, press the end of the tool lightly to your right, in the meanwhile raising it, thus causing the working end of the tool to slide slowly downward on the revolving metal disk, being careful to gradually reduce the pressure on the handle as the tool nears the edge of the metal. If this latter precaution is not observed, the result will be a very wrinkled piece of metal. Repeat this operation again and again, until the metal has been pressed closely to the spinning block, thus producing the finished object, which in this case is a saucer.

The next step is the trimming of the edge of the saucer. For this a three-cornered file, ground sharp on all sides, may be used. The handle on this file should be about 10 in. long. To trim the edge of the spun article, move the left end of the tool rest close up to the edge of the article. Then, with the finished object revolving, lay the end of the trimming tool on top of the tool rest and slip it ahead slowly until it starts cutting a very thin chip or shaving off the revolving metal. When the edge of the spun object has been cut perfectly round, press a piece of emery cloth against it, to smooth it and to remove all sharp burrs. This finishes the job.

Vocational and Educational Guidance Opportunities Inherent in Industrial Arts

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While this article is based on a study made by Professor J. F. Friese in 1920, it contains so much that the shop teacher of today may apply, that it is well worth perusal.

It is a general belief that our schools should center about the child and that his judgments, aptitudes, and abilities should be taken into consideration so that his school experiences may fit and match his experiences in life. As an outgrowth of this general belief, school administrators throughout the country are now studying the development of a school curriculum that will function in a positive way in present-day life.

One result of this development is a definite guidance program to become an integral part of the school curriculum. *This newer phase of education should be of vital interest to every teacher of industrial arts, because it gives to the manual activities their true place in education.* Surely exploratory experiences, related information, occupational information, and preliminary vocational training are a vital part in any progressive industrial-arts program and just as surely these same objectives are decidedly an integral part of any worth-while guidance procedure. Since this is an indisputable fact, it may be well to follow with data regarding the guidance possibilities inherent in industrial arts.

Diversified shop work provides numerous opportunities to apply knowledge gained elsewhere, and therefore teaches the value of the application of theories and principles to real construction. The shops make it possible to give students a variety of experiences with various tools, machines, materials, fundamental industrial facts, and related information, all of which is so important in helping the boy at school to arrive at a final decision on the type of work which he wishes to follow in later years.

Many teachers neglect woefully to make the related and occupational information a part of their shop courses. A shop job that requires six or eight hours for completion may well present opportunities for several more hours of study in industrial geography, applied science, or other closely connected information material. Unfortunately, this vital part of instruction is overlooked all too frequently.

The shops should be laboratories in which all academic concepts and principles are actually applied. It is in the shop where the student receives a variety of experiences with various tools and materials, and it should also be in the shop where he acquires fundamental industrial facts, and related information. The wide-awake industrial-arts teacher uses his shop subject as a vehicle teaching the application of much of the abstract content in mathematics, science, geography, history, English, and other subjects in the curriculum.

Tying Industrial Arts with Guidance

The various types of shop work will continue to be offered, but the industrial-arts teacher should not forget that the type of shop, or the kind of equipment, or the particular terminology given the subject is not the most important thing to consider. Rather must he see to it that the proper content material is placed in the various activities; that proper projects and constructions are selected; that the situations created in each work room are only those that will properly *motivate the exploratory experiences desired,* develop the related occupational and technical information that is essential, and that all activities are properly evaluated and co-ordinated into a forceful and desirable curriculum.

Vocational and educational guidance inherent in industrial arts can be evidenced in two ways.

1. Through the study of vocational information which is, briefly, organized descriptive material pertaining to the various occupations. used for class or group discussion or for individual study, and often supplemented by visits to plants and factories.

2. Through exploratory activities which are essentially organized vocational experiences offered in classrooms equipped

with tools, appliances, and materials of a variety of occupations.

Personal and physical fitness may be partially uncovered for an individual by means of vocational information as well as experiences in the shop. A study of the specifications of various occupations may prompt the student to make a serious self-appraisal, leading to a better understanding of what he has and what he does not have in the way of physical and personal qualifications for certain fields of work. Industrial-arts work then offers guidance possibilities, because:

1. Exploratory activities provide the most desirable means to reveal vocational aptitudes and abilities. They serve to develop aptitudes that would not be brought to light except through a range of shop experiences.

2. After a period of exposure the individual will become conscious of what his physical attributes or shortcomings are in terms of vocational specifications. In other words, the individual should know very definitely the part that eyesight, hearing, appearance, patience, nervous system, and the like, play in making a success in particular occupations.

The topic as follows takes up the vocational and educational guidance work as done in the Technical High School, St. Cloud, Minnesota, under the supervision of J. F. Friese of the Manual Arts Department in 1920.

I. Conditions: Two years' trial

A. School of 700 pupils, 35 teachers in the school system of a city with a population of approximately 17,000.

B. Agriculture, manufacturing, and railroad center like those which exist in many parts of the United States.

C. Occupational study required as extra-curricular study. Required for graduation in addition to usual units of high-school work.

II. Methods of Providing Occupational Study

A. In all manual-arts work, giving of occupational information is made one of the principal objectives of that work.

1. Information on trades represented in school shops as regards working conditions, salaries, wages, preparation, health of workers, products, etc.
2. Instructors should ever be alert for opportunities to present such information as special situations arise, especially in exploratory courses.

B. Second Method

1. Various high-school teachers each prepare from one to four informal talks on various occupations.
2. Talks followed by questions, discussions, and individual conferences.
3. Teachers selected carefully for each occupational talk. Forty-eight talks given in one year.
4. Freshmen and sophomores required to attend 18 or more of these talks.
5. Seniors required to attend 12 talks and their selection should indicate interests.
6. Senior students select talks they wish to be given.

III. Occupations Studied

A. Both local and general occupations studied (to give student a broad, comprehensive view of all fields of human endeavors).

B. Studies for boys, studies for girls, or both

1. Accounting, banking, bookkeeping, commercial art, costume designing, dairying and livestock, dentistry, dressmaking, electrical work, engineering, farming, garage work, selling, granite cutting, government service, interior decoration, journalism, library work, marketing, drafting, medicine, milling, nursing, dietetics, pharmacy, printing, social work, stenography, stone work, transportation (railroading), metal trades, building trades.

IV. How Information is Secured

A. Through gathering of special data at time of school census.

B. Through special reports of U. S. census.

C. Through questionnaires filled by wage earners of families represented in school.

D. Through personal investigation by the instructors.

V. Organization of Material

A. All organized so various important phases of a large number of occupations will be considered.

1. Questionnaires were all studied and consolidated into one sheet.

VI. Phases of Occupations Stressed

A. General description of tools and work.

B. The workers, their number, how recruited, how trained, organized, turnover, and limitations.

C. Requirements

1. Physical 2. Educational 3. Mental

D. Working Conditions

1. Hours 2. Health 3. Liability to accident

E. Wages, salaries, length of training period.

F. Special vocational advice as to best schools to attend, costs, local people to get advice from, application for and successful holding of positions.

VII. Schedules

A. Forty-five-minute talks given to lower classes three times during first semester.

1. Placed during time when largest group can attend and after-school-help period.
2. Sometimes entire classes excused to hear talks.

B. Senior talks shortened to 30 minutes or less.

1. Talks usually given during hours of homeroom period.

C. Individual conference of all seniors before graduation.

D. At the time, planning to have individual conferences with all students early in first semester of each year by or with the vocational adviser.

E. All freshmen fill out a personal card which indicates ambitions, likes, etc.; parents also fill in a section giving their hopes and plans for the child. These cards follow the pupil through the school and are used at time of senior conference.

VIII. Conclusions on St. Cloud Program

A. Information given must leave with the pupils all of the truth in an unbiased manner. Otherwise open to criticism.

B. All studies must be made as interesting as possible to the young minds. Use devices to develop material in interesting manner.

C. Information given, to be of greatest value, must be used definitely in some way either through educational or vocational advisement or both, before the pupil leaves school.

D. Advisement should help teach boys and girls methods of helping themselves to weigh, study, and analyze their aptitudes and occupations in which such aptitudes would successfully and happily function, and to reasonable methods of determining what education or training is necessary.

A checking of 250 graduates has found large numbers in occupations or schools about which they were given information and directed, though always with the final choice being left solely to themselves.

Results warrant a continuation of the plan.

Conclusions and Summary

Elements serving the end of guidance in industrial arts:

1. Provides for the study of occupational literature.

2. Provides an opportunity to observe conditions of employment and how work is carried on.

3. Provides exploratory and tryout opportunities through school shop experiences.

4. Provides an opportunity to develop through all the foregoing methods as well as drawing, design, class discussions, and appreciative understanding of vocational pursuits.

5. After a vocational choice is made, guidance related definitely to the occupation selected is provided; machinists advised to study mathematics, printers ad-

vised to study English, etc.

6. Tryout courses lead to the elimination of undesirables.

Since a large percentage of the people are going to be engaged in industrial and commercial occupations, contact with and participation in industrial-arts work helps in this adjustment to occupations. By the process of elimination, the pupil will take to those that present the greatest appeal.

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Industrial Arts, Household Arts, and Occupational Information

I. M. Fenn

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Helping the student to find an answer to his own problem.

Information and guidance in occupations should be included in the industrial-arts and household-arts courses of study in every progressive high school.

The greater the range of selection in the matter of life careers, the more difficult becomes the task of making a wise selection and the greater the chance of error.[1]

Frequently students question themselves as to the reasons why English and mathematics are forced upon them in their particular courses. These same students may have already made their decisions as to the particular occupation they wish to enter. Most likely their interests have not been discussed in the classroom. They have not been exposed to information concerning the qualifications, requirements, advantages and disadvantages of their individual occupational interests. The students, if given this information and guidance, would soon realize that the knowledge of English, mathematics, and the other subjects of the curriculum are very important since there is a relationship between those subjects and their interests. One would be amazed at the diversification of occupational interests high-school students have.

The collection of occupational information first involves the gathering of the various books on occupational guidance. The following have been found helpful for a general preview of the various vocations and general plans of occupational consideration:[2]

1. *How to Find the Right Vocation,* by Harry Dexter Kitson, Harper and Brothers, New York City, 1927.

2. *Vocational Self-Guidance,* by Douglas Fryer, J. P. Lippincott Co., Philadelphia, 1925.

3. *An Outline of Careers,* edited by Edward L. Bermays, George H. Doran Co., New York, 1927.

4. *The Choice of An Occupation,* by A. B. Crawford, etc., Yale University Press, New Haven, Conn.

5. *New Careers for Youth,* by Walter B. Pitkin, Simon and Schuster, New York, 1934.

6. *Careers,* U. S. Department of the Interior, Office of Education, Washington, D. C., 1930.

7. *Occupations for Women,* by O. L. Hatcher, Southern Woman's Educational Alliance, Richmond, Va., 1927.

8. *She Strives to Conquer,* by Frances Maule, Funk and Wagnalls, New York, 1934.

9. *Careers for Women,* by Catherine Filene, Houghton Mifflin Co., Boston, 1926.

10. *Occupations,* by E. B. Gowin, W. A. Wheatley, and J. M. Brewer, Ginn and Co., Boston, 1916.

11. Inor Group Guidance Series — Vol. I, *Common Problems in Group Guidance;* Vol. II, *Case Conference Problems in Group Guidance;* Vol. III, *Self-Measurement Projects in Group Guidance,* by Richard D. Allen, Inor Publishing Co., New York, 1934.

12. *Vocational Guidance and Success,* E. J. Gallagher, The Bruce Publishing Co., Milwaukee, Wis.

13. *My Educational Guidebook,* R. H. Rodgers, The Bruce Publishing Co., Milwaukee, Wis.

14. *My Vocational Guidebook,* R. H. Rodgers, The Bruce Publishing Co., Milwaukee, Wis.

15. My Life Work Series in four parts: *Building and Metal Trades, Printing and Servicing Trades, Store and Office Occupations, Representative Industries,* by R. L. Cooley, R. H. Rodgers, and H. S. Belman, McGraw-Hill Book Company, Inc., New York City.

Reading and studying about professions and careers are excellent means of starting the student to think seriously about his future.

A student should choose his vocation only after careful consideration. The obtaining of practical information about occupations and jobs appears to present the greatest difficulty. Occupational information seems a more appropriate designation than vocational guidance. If the student is given adequate occupational information, he should be able to do his own vocational guidance. Actually directing a student into a vocation may be dangerous. Self-guidance based on adequate and reliable information is better.[3]

Then why not introduce the students to our economic and industrial organization immediately upon high-school entrance, and have this guidance extend throughout their high-school years, so that they may understand the reasons for the various courses of study? Better attitudes and habits would then be established in their schoolwork.

This form of training would also be sufficiently specific for some students who leave school before they have completed their high-school course, in securing employment in any one of a number of industries.

This interpretation of the various occupations can best be arranged for the students through the social organization which exists in the industrial-arts and household-arts courses in the high schools.

There can be no question about the change of attitude and, thereby, the improvement in the work of the student which will be accomplished by means of this better understanding between the student and the subject.

[1] W. H. Proctor, *Educational and Vocational Guidance,* Houghton Mifflin Company, New York, 1925, p. 5.

[2] J. E. Walter, *Individualizing Education by Means of Applied Personnel Procedures,* John Wiley and Sons, New York, 1935, pp. 223–224.

[3] J. E. Walters, *ibid.,* p. 225.

Thought for the Week

E. C. Estabrooke

Maury High School,
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Thought for the week is, as the name implies, a motto, slogan, verse, or any type of concise thought, printed in poster form by the school print shop and displayed throughout the school each week. There are thousands of elevating thoughts to be found in libraries, newspapers, magazines, calendars, and other sources easily accessible to instructors and students. Sayings of famous men, bits of philosophy — any statement with a good moral that will make a student stop and think, can well be used. Does the instructor have to "dig up" these thoughts himself? Yes, the first time, and only time. After that, mottoes and slogans of every kind come streaming in, not only from printing students but from other students, and teachers as well, with the request to print *his* or *her* thought for the current week. From these contributed thoughts, the most suitable one is chosen by the instructor and the remaining ones kept on file for future reference.

How Handled Typographically

Experience with these posters in the Maury print shop have proved the project method by far the best. If a printing student brings in a suitable thought, let him produce it from start to finish. The idea of turning out an attractive poster, to be displayed before every teacher and student in the school, is a vital interest factor to any boy. He'll start the job with a bang and work like a Trojan until it's completed. Have him make a layout — in fact, several of them. The boy learns about design, balance, harmony, and appropriate type sizes by doing this. Then check the layouts with him and help him select the best one. Suggest changes if necessary. Make sure he knows exactly how the job will look when finished. One very important advantage of a layout is that you can catch mistakes and misunderstandings before the boy sets the type. It prevents him from embedding wrong ideas in his mind, and saves time in breaking up a poor job and starting over again. In completing the job, the boy practices all the operations of hand composition, lock-up, press make-ready, press feeding, washing up, and distribution of the form. In short, he plans and executes a complete job of printing by himself — a real project.

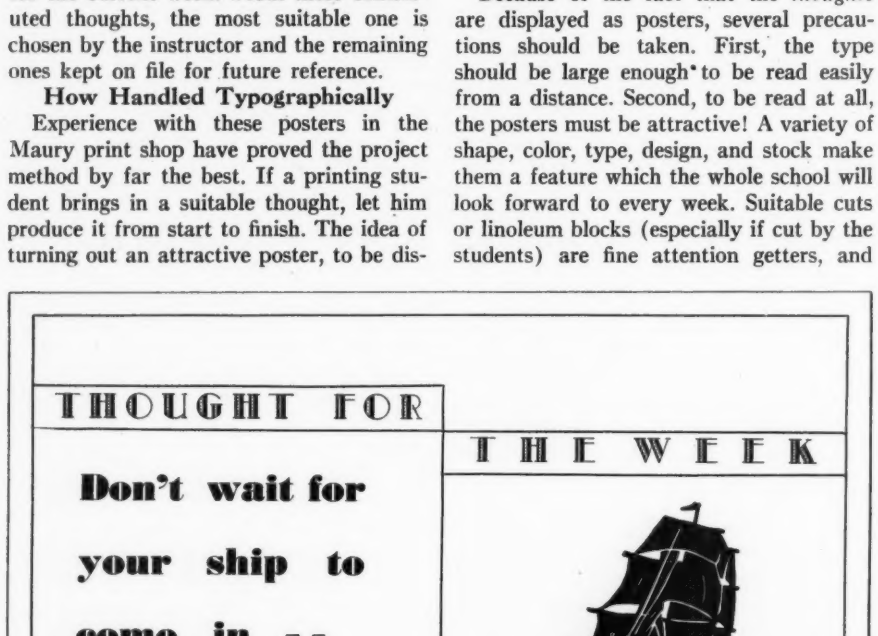
Because of the fact that the *thoughts* are displayed as posters, several precautions should be taken. First, the type should be large enough to be read easily from a distance. Second, to be read at all, the posters must be attractive! A variety of shape, color, type, design, and stock make them a feature which the whole school will look forward to every week. Suitable cuts or linoleum blocks (especially if cut by the students) are fine attention getters, and their use is valuable because of the originality displayed.

Not a new project, nevertheless, it is a good one for the school print shop.

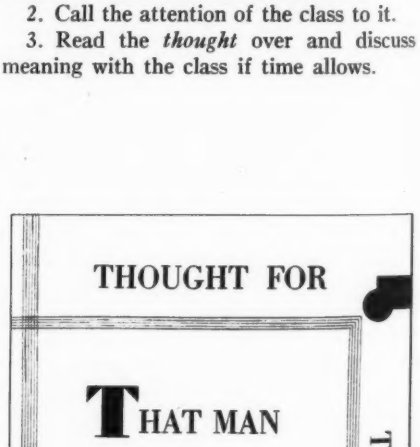
How the Posters are Distributed and Displayed

In Maury High School the *thoughts* are printed by Friday afternoon and delivered to the head office clerk who attaches one to each of the homeroom rolls sent to the 85 homerooms early Monday morning. The distribution problem may differ, of course, in every school. The important thing is to have the posters delivered every Monday morning *without fail.* To miss a week, or even a day, will show careless planning on the part of the printing department. In order to make the *thought for the week* most beneficial to all concerned, the cooperation of the teachers must be assured. The following suggestions to teachers may be offered (preferably on a memorandum printed in the shop).

1. Post the thought in a prominent place in the room as soon as it is received.
2. Call the attention of the class to it.
3. Read the *thought* over and discuss meaning with the class if time allows.



Motto printed in black and green



Printed in black and red

4. Advise class that the posters must be left up until the following week. (The tendency is for the students to take them during the current week and post them in their rooms at home.)

5. Use the *thought* for oral reports, English themes, homeroom programs and at any other opportune time.

Arousing Added Interest

The school paper affords a splendid medium. A *thought for the week* article is written in the "Maury News" by one of the staff each week. It includes:

1. Name of contributor and his or her homeroom.
2. Name of typographer from printing department.
3. Name of author or originator of the *thought*.
4. Explanation of the thought — philosophy, etc.
5. How *thought* can be applied and carried out by all.

Also, a box is allotted each week in which the *thought for the week* is displayed in black and white in as similar form to the original poster as possible.

After the posters were displayed at Maury the first week, an article was run in the school paper requesting students to submit *thoughts* to the printing instructor. If a school has no paper, a similar announcement can be made in assembly or in each individual room.

After the project had been carried out in Maury High School for some months, a questionnaire was administered to 3,000 students to determine its value. A faculty questionnaire also was given to 100 Maury teachers, and the questions asked in such a way as to make possible a correlation of faculty opinion with that of the student body. The questionnaires were carefully checked, rechecked, and tabulated.

Judging from the responses, the value of the feature is certainly proved. If 94.16 per cent of the students read the *thoughts*, and 79.6 per cent benefit by them in some way, as shown by the questionnaire, the amount of good achieved seems much worth while. Over 94 per cent of the students and teachers recommend that the posters should be continued as a permanent weekly feature in Maury High School, while 90.5 per cent of the student body and 86.5 per cent of the faculty believe the *thoughts for the week* would be helpful to other schools. These results seem significant because Maury, the largest high school in the State of Virginia, is typical of other educational institutions throughout the country. The content of the *thoughts* must necessarily be different for junior high and grammar schools. Short, direct thoughts, easy to read and understand, are best for the lower grades. Any well-known thought that originated from a famous character will create an impression on growing boys and girls which will always be remembered.

Regardless of content, the principle of displaying worthy thoughts before students is of inestimable value.

Driving With Safety

A. H. Vance

McNaughton, Wisconsin

Safe-driving courses may be a solution to the question of how to reduce the terrific havoc now caused by careless and incautious auto drivers.

In the early days of the automobile, anyone who could shift gears and keep a car between the fences was considered a good driver. If, in addition, he could make minor repairs to his car, he was classed a mechanic. And, if he could take it apart and get all the pieces back so the machinery would still run, he was rated an expert.

Modern traffic conditions and the natural growth of the automobile industry have changed all this, however, and *good* driving, which is synonymous with *safe* driving, has become a very complex affair. It is even possible that only a short time will elapse before all drivers will not only be required to know the exact mechanical condition of their cars at all times, but will also be held directly responsible for any accident in which they are found at fault. The alarming increase in automobile accidents during the past few years, points definitely toward the necessity of teaching all drivers to drive safely.

Statistics apparently show that at least two thirds of all reported accidents are due to some hasty, needless, or careless act on the part of a driver. From this, one is forced to conclude that a fairly high percentage of drivers are far from being good ones. Apparently, the common-sense rules for safe driving are either unknown to many, or are being widely ignored. In either case, if the present educational system, and the general public, fail to cooperate to prevent this appalling waste of human life, then undesirable restrictive legislation must necessarily take a hand.

Yet, obeying a single rule would prevent most accidents, and make good drivers out of nearly everyone: *Keep your car under control at all times!* Every state law, and every municipal ordinance is founded upon this rule and is in reality an attempt to make it work. Even the right-hand rule of the road, laws relating to left turns, lights, and literally hundreds of other driving codes designed to facilitate the movement of traffic, are built on this rule. If it were obeyed, the only accidents would be those due to unexpected breakage, or to other unpredictable causes.

Keep your car under control, means many things. It means the ability to either stop, or to dodge without endangering others, any unexpected obstacle. A car is definitely "out of control" when passing another car on a hill or on a curve; when cutting-in ahead of another car on a crowded highway; when due allowance has not been made for icy pavements, poor brakes, or worn tire treads; and when a driver has no choice except to hit a pedestrian who steps out unexpectedly from behind another car. True, the pedestrian is probably at fault, but fast driving past parked cars is a risky thing at best. Steam rollers, or even tractors, have been known to drive out on the highway from behind parked cars.

The inability of a driver to react quickly in emergencies is a very real hazard, placing his car definitely "out of control." Experiments have shown that most drivers cannot think sufficiently fast for safety when driving at speeds in excess of forty miles per hour. Experienced drivers, generally, study not only their own limitations, basing their driving speeds upon this factor, but also maintain a continuous check on the mechanical ability of their car to respond to the demands they make upon it.

This continuous check is absolutely necessary because fatigue induced by long periods of driving, or from any one of a number of other causes, places a definite limit on a driver's thinking ability. An ever-increasing alertness to weather, traffic conditions, and to the mechanical condition of the car is desirable as the hours of the day pass. This is proved conclusively by statistics which show that 1 per cent of the total number of accidents occur during the morning hours, increasing gradually to 8 per cent at eight o'clock in the evening.

The driver fatigue induced by driving is quite often due to the handicaps placed up-

on a driver by the construction of modern cars. Lowered seat positions generally, tend to restrict a driver's view of the road, with special reference to the right-hand edge of the concrete, which is extremely important in highway driving. Even the fenders of most cars cannot be seen from the driver's seat, adding to the strain of meeting and passing other cars, as few drivers are able to judge within several inches, the exact location of their own fenders. Raising the seat cushion by blocking beneath it is often of great assistance to driving.

Following cars are difficult to see if reliance is placed entirely in the rear-view mirrors with which most cars are regularly equipped. This is due to the existence of a so-called "blind spot" at each rear corner of closed cars. The addition of an extra mirror, mounted on the front edge of the left-hand door provides a better view of cars coming up from the rear. The only alternative to the use of this mirror is to look backward through the door by turning the head, a feat which is prohibited in some states.

Steering gears which require more than three complete turns of the wheel between the extreme right and left turn positions of the road wheels are a positive impediment in the way of quick control of a car. Accurate steering is often impossible with these gears of the "easy parking" type at a reasonable speed. Unfortunately, there is no remedy for a car so equipped except a new steering gear.

After making due allowance for these natural handicaps to driving, a very few rules for safe driving can be considered. It is neither necessary nor advisable to confuse a student with any complete set of rules, since the use of the one fundamental law of control will work out best.

The rules for right and left turns as evolved over a period of years, are quite simple. Knowing that a right turn is to be made at the next intersection, a driver should cut slowly into the right-hand line of traffic, or at least far enough to the right side of the street to prevent another car edging past on his right. If this maneuver is executed properly, collision from a following car is virtually impossible.

Left turns can best be made by keeping well toward the center of the highway, or even beyond the center if opposing traffic permits. In any case it is well to force the driver of a following car to slow down by forcing him into the other traffic stream. A reasonably sensible driver will usually take this rather broad hint and permit the car ahead to make a safe left turn.

Signaling turns or stops by extending an arm through the window, should, of course, always accompany the maneuvering of the car into proper position for making the turn or stop. When in doubt as to what the driver ahead intends to do, slowing down is always in order. Adverse driving conditions always call for low speeds, a rule which should be impressed upon any new driver.

Watching the right-hand edge of the concrete and keeping as close to this edge as possible, rather than merely planning on missing the car when meeting, generally works out best. The same plan is entirely practical when meeting cars at night with glaring headlights. A spotlight with its beam fixed on the exact edge of the road in its proper relation to the car will assist materially in night driving. The effect of meeting another car head on at forty miles per hour is about the same as driving off the top of a five-story building, a fact which is worth remembering.

Many driver tests include a study of individual reaction to signals and orders. Tests of this kind can be easily made in almost any school auto shop since an ordinary stop watch is accurate enough for this purpose. A student's mental ability to react at various times of the day to stop and go signals would also be of considerable value in a study of fatigue. Since the presence of carbon-monoxide gas in closed car bodies is a large factor in causing driver fatigue an interesting project, if means are available, would be the analysis of the air in a closed car after a short period of hard driving with the windows closed. The results of such a test will prove surprising, even to those who are familiar to the deadly nature of this gas.

These studies may be amplified, if desired, by an analysis of car performance on the road. Thus, the tendency of a car to "weave," or to show other signs of instability, is a danger sign. The speed at which these things occur definitely marks the top limit of safe driving speeds for that particular car. Generally, especially for the lighter cars, this instability becomes felt by a driver at speeds below fifty miles per hour. A strong side wind often reduces the safe driving speed for light cars well below forty miles per hour.

Another interesting study is an attempt to improve the distance judgment of embryo drivers. This can be done by diagrams, but road practice is by far the best. The student is required to judge the probable speed of a car by the rate of size increase as it approaches. The best drivers have a keen sense of driving distance judgment. Those who lack this qualification should be required to know their lack and to make due allowance. A knowledge of the accelerating ability of a car is important, but should be gauged by distance on the road rather than miles per second per second.

Testing and Tests

TEST FOR THE BEGINNING ELECTRICITY CLASS

H. L. Stiles, High School, Nogales, Arizona

Introduction:

1. This test contains 50 true-false statements.
2. Read each statement carefully.
3. If you think the statement is true, put a plus (+) at the end of the statement.
4. If you think the statement is false, put a zero (0) in the parentheses at the end of the statement.
5. Twenty minutes is the proper time allowance for this test.
6. Study the samples carefully before beginning actual work.

Samples:

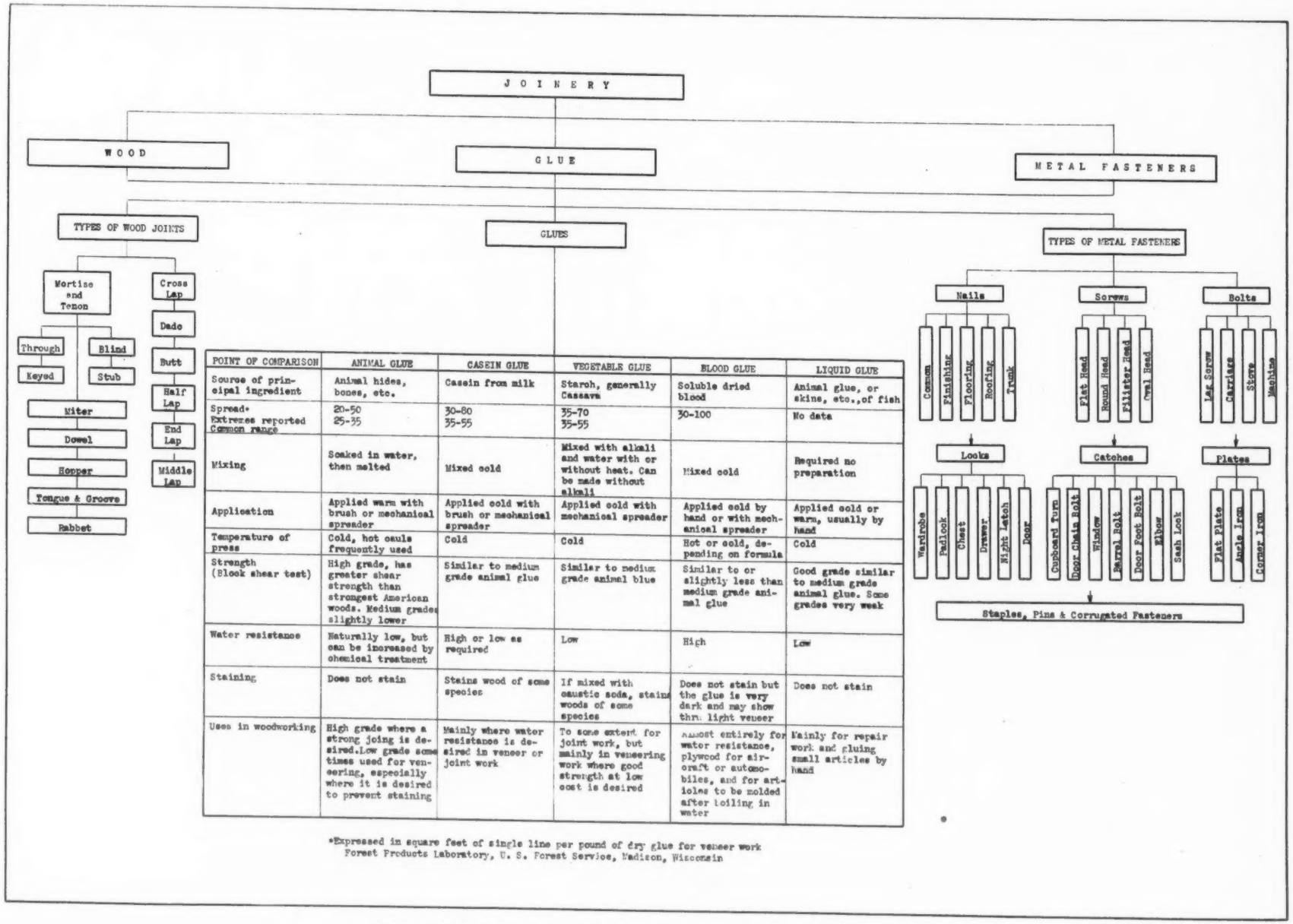
1. Magnets have two poles. (+)
2. Dynamos transform chemical energy into electrical energy. (0)

Test statements:

1. The unit used to measure electrical pressure is called the volt. ( )+*
2. Marconi invented the first practical telegraph. ( ) 0
3. The hydrometer is used to determine the condition of a storage cell. ( )+
4. A molecule consists of two or more atoms. ( )+
5. The electrolyte in a simple cell is made by mixing sulphuric acid and water. ( )+
6. A simple cell has two copper electrodes. ( ) 0
7. A current of electricity may be generated by moving a coil of wire between the poles of a horse-shoe magnet. ( )+
8. An electric current that flows in one direction for a short time and then reverses and flows in another direction is called an alternating current. ( )+
9. Telephone transmitters contain electromagnets. ( ) 0
10. All splices on electric wires should be twisted tightly and soldered. ( )+
11. The telegraph sounder is operated by an electromagnet. ( )+
12. Permanent magnets are made of soft iron. ( ) 0

*The key letter appears at the right of each test question.

(Concluded on page 381)

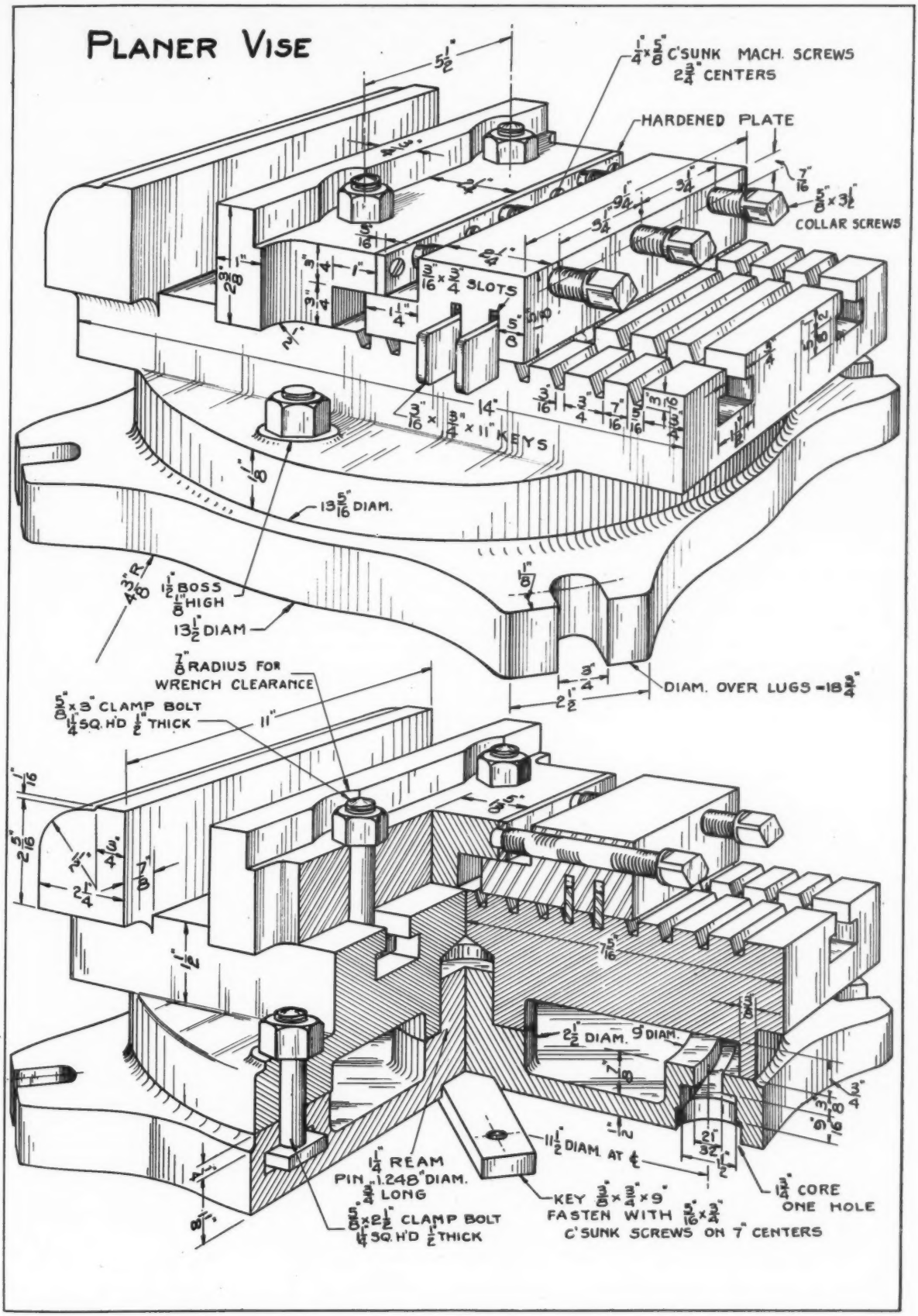


POINT OF COMPARISON	ANIMAL GLUE	CASEIN GLUE	VEGETABLE GLUE	BLOOD GLUE	LIQUID GLUE
Source of principal ingredient	Animal hides, bones, etc.	Casein from milk	Starch, generally Cassava	Soluble dried blood	Animal glue, or skins, etc., of fish
Spread* Extremes reported Common range	20-50 25-35	30-80 35-55	35-70 35-55	30-100	No data
Mixing	Soaked in water, then melted	Mixed cold	Mixed with alkali and water with or without heat. Can be made without alkali	Mixed cold	Required no preparation
Application	Applied warm with brush or mechanical spreader	Applied cold with brush or mechanical spreader	Applied cold with mechanical spreader	Applied cold by hand or with mechanical spreader	Applied cold or warm, usually by hand
Temperature of press	Cold, hot cauls frequently used	Cold	Cold	Hot or cold, depending on formula	Cold
Strength (Block shear test)	High grade, has greater shear strength than strongest American woods. Medium grades slightly lower	Similar to medium grade animal glue	Similar to medium grade animal blue	Similar to or slightly less than medium grade animal glue	Good grade similar to medium grade animal glue. Some grades very weak
Water resistance	Naturally low, but can be increased by chemical treatment	High or low as required	Low	High	Low
Staining	Does not stain	Stains wood of some species	If mixed with caustic soda, stains woods of some species	Does not stain but the glue is very dark and may show thru light veneer	Does not stain
Uses in woodworking	High grade where a strong joing is desired. Low grade sometimes used for veneering, especially where it is desired to prevent staining	Mainly where water resistance is desired in veneer or joint work	To some extent for joint work, but mainly in veneering work where good strength at low cost is desired	Almost entirely for water resistance, plywood for aircraft or automobiles, and for articles to be molded after boiling in water	Mainly for repair work and gluing small articles by hand

*Expressed in square feet of single line per pound of dry glue for veneer work
Forest Products Laboratory, U. S. Forest Service, Madison, Wisconsin

Submitted by George C. Decker, State Teachers College, Buffalo, New York

To make this tracing transparent, rub the back of it with any of the cotton-seed or corn oils.


PLANER VISE
1¼ × ⅝ C'SUNK MACH. SCREWS 2¾ CENTERS
HARDENED PLATE
⅝ × 3½ COLLAR SCREWS
13/16 × ¾ SLOTS
3/16 × 1/4 × 11 KEYS
13 5/16 DIAM.
1½ BOSS ⅛ HIGH
13½ DIAM
⅞ RADIUS FOR WRENCH CLEARANCE
⅝ × 3 CLAMP BOLT ¼ SQ. H'D ½ THICK
DIAM. OVER LUGS = 18¾
1¼ REAM PIN .1.248" DIAM. ¾ LONG
⅝ × 2½ CLAMP BOLT ¼ SQ. H'D ½ THICK
KEY ⅜ × ¾ × 9
FASTEN WITH 5/16 × ¾ C'SUNK SCREWS ON 7" CENTERS
2½ DIAM. 9 DIAM.
11½ DIAM. AT ℄
1¾ CORE ONE HOLE

Submitted by W. A. DeVette, Erie, Pennsylvania. Described on page 384.

To make this tracing transparent, rub the back of it with any of the cotton-seed or corn oils.

Test for the Beginning Electricity Class

(Concluded from page 376)

13. Electromagnets get their magnetism from a current of electricity. ( )+
14. Transformers are used with direct current. ( ) 0
15. A 60-cycle current changes its direction 60 times a minute. ( ) 0
16. Copper wires of small diameters offer low electrical resistance. ( ) 0
17. Compass needles are made of brass. ( ) 0
18. The common dry cell has a pressure of about 1.5 volts. ( )+
19. A fully charged cell should register between 1,270 and 1,300 when it is being tested. ( )+
20. In reading the electric meter, if the hundreds hand is between 5 and 6, it indicates 600. ( ) 0
21. The electrodes in a dry cell are made of zinc and carbon. ( )+
22. When a rod of hard rubber is rubbed with wool, a positive charge is produced on the rod. ( ) 0
23. Electrical energy is measured in kilowatt hours. ( )+
24. No. 20 wire is larger in diameter than No. 15. ( ) 0
25. The telephone receiver and the loud speaker on a radio operate on the same principle. ( )+
26. The north pole of a magnet will attract the north pole of another magnet. ( ) 0
27. Relays are used to send telegraph messages long distances. ( )+
28. Porcelain is a common insulating material. ( )+
29. Solder is a compound of 50 per cent zinc and 50 per cent lead. ( ) 0
30. Lightning rods help to equalize the charge of static electricity between the clouds and the earth. ( )+
31. The armature is the turning part of an electric motor. ( )+
32. Modern light bulbs use a carbon filament. ( ) 0
33. Distilled water is used in storage batteries. ( )+
34. Insulation is used on electrical conductors to prevent a short circuit. ( )+
35. Ammonium chloride is used in dry cells. ( )+
36. Storage batteries give alternating current. ( ) 0
37. Electromagnets have a soft-iron core. ( )+
38. The switch on the meter board should be opened before work on the electrical circuit in the house is to be attempted. ( )+
39. Fuse plugs are used to protect the home against fire caused by short circuit. ( )+
40. The geographic north pole and the magnetic north pole are located at the same place. ( ) 0
41. The earth acts like a bar magnet. ( )+
42. An overloaded circuit will cause a fuse plug to burn out. ( )+
43. The fuse wire in a fuse plug is made from material that has a high melting point. ( ) 0
44. When a fuse plug burns out, a penny placed in the socket will serve just as well. ( ) 0
45. The best resistance units in electric irons are made from an alloy of nickel and chromium. ( )+
46. The breaker point on a door bell opens and closes the electrical circuit. ( )+
47. Tape is used on a splice to make it stronger. ( ) 0
48. A binding post on a dry cell is called a terminal. ( )+
49. Water is not a good conductor of electricity. ( )+
50. The wattmeter is used to measure kilowatt-hours of electricity. ( )+

EXAMINATION FOR THE ARCHITECTURAL DRAFTING CLASS

H. H. Robinson, Augusta, Kansas

The following test has been prepared to parallel the work of a definite set of assignment sheets for house drawing used by the author. It may, however, be found helpful by other teachers of architectural drawing, and it is submitted herewith for this reason.

In using these test questions, it will be found that they are not all objective. There are several that have more than one correct answer and the interpretation that the pupils may place upon several of the questions will depend upon the emphasis placed upon certain phases of the instruction. These more or less subjective questions have been included because they are thought provokers and may serve a purpose in a short shotgun quiz even though the questions may be too subjective or unimportant to merit a place in a final examination.

Questions on House Drawing

1. The following factors increase the value of a building site: (*a*) ———; (*b*) ———; (*c*) ———; (*d*) ———; (*e*) ———; (*f*) ———.

2. The following factors decrease the value of a building site: (*a*) ———; (*b*) ———; (*c*) ———; (*d*) ———; (*e*) ———; (*f*) ———.

3. In designing the kitchen, the following things should be considered: (*a*) ———; (*b*) ———; (*c*) ———; (*d*) ———.

4. In designing a pleasant bedroom, the following items should be considered: (*a*) ———; (*b*) ———; (*c*) ———; (*d*) ———; (*e*) ———.

5. In designing a pleasant dining room, the following items should be considered: (*a*) ———; (*b*) ———; (*c*) ———; (*d*) ———; (*e*) ———.

6. The following built-in features should be shown on the floor plan: (*a*) ———; (*b*) ———; (*c*) ———; (*d*) ———; (*e*) ———.

7. Show the symbols for representing the following on a floor plan: (*a*) outside door ———; (*b*) casement window ———; (*c*) double-action door ———; (*d*) single-sash basement window ———; (*e*) double-hung window ———; (*f*) inside door ———.

8. Show the symbols for representing the following electrical outlets on a floor plan: (*a*) ceiling ———; (*b*) floor ———; (*c*) single switch ———; (*d*) three-way switch ———; (*e*) single convenience ———; (*f*) double convenience ———; (*g*) wall bracket ———; (*h*) telephone ———; (*i*) bell push button ———.

9. Name ten electrical appliances for which necessary outlets should be provided: (*a*) ———; (*b*) ———; (*c*) ———; (*d*) ———; (*e*) ———; (*f*) ———; (*g*) ———; (*h*) ———;(*i*) ———; (*j*) ———.

10. ———soil is most likely to cause a damp basement.

11. A foundation may be waterproofed by coating it with ———.

12. Another method for making a basement dry is as follows: ———

———.

13. The bottom of the foundation wall is called the ———.

14. A 1-3-5 mixture of concrete contains one part of ———, three parts of ———, and five parts ———.

15. The most nearly waterproof mixture of concrete is the ——— mixture.

16. The quality of a fine aggregate for concrete work should be judged on the following points: (*a*) ———; (*b*) ———; (*c*) ———; (*d*) ———.

17. The following are qualities to be considered in selecting a coarse aggregate: (*a*) ———; (*b*) ———; (*c*) ———; (*d*) ———.

18. The symbols for materials in cross section are as follows: (*a*) concrete———; (*b*) cut stone ———; (*c*) brick ———; (*d*) tile ———; (*e*) wood ———.

19. Since concrete is not strong in tension,

	Initial Cost	Fuel Consumption	Repair Costs	Room Required	Adaptability & Effectiveness	Ventilating Qualities
Pipeless Furnace						
Hot-Air Furnace with Pipes						
Steam						
Hot Water						

Table I. Heating systems

it is ——— where subject to pulling or tensile stresses.

20. A 2 by 8 joist is ——— times as *stiff* as a 2 by 4 joist.

21. A 2 by 12 joist is ——— times as *stiff* as a 3 by 8 joist.

22. A 2 by 6 joist is ——— times as *strong* as a 2 by 4 joist.

23. A 2 by 8 joist is ——— times as *strong* as a 4 by 4 joist.

24. Automatic water heaters that insure a constant supply of hot water for the home operate in the following way: ———

———

———

25. Discuss the merits of the different kinds of heating systems upon the points shown in Table I.

26. A roof of good-grade cedar shingles should last about ——— years, and one of cypress shingles ——— years.

27. A 5-2 shingle is ——— of an inch thick at the butt and a 6-2 shingle is ——— of an inch thick at the butt.

28. Wood shingles are usually laid ——— inches to the weather.

29. Wood shingles should be fastened with ——— or ——— nails.

30. Asphalt composition roofing can be bought in either ——— or ———.

31. A good brand of asphalt shingles should last about ——— years.

32. The following roofing materials are fireproof: (*a*) ———; (*b*) ———; (*c*) ———.

33. The following roofing material is not firepoof but is more fire resisting than wood shingles ———.

34. The following roofing materials are very heavy and so require extra heavy rafters: (*a*) ———; (*b*) ———.

35. Roofing tile is made in the following shapes: (*a*) ———; (*b*) ———; (*c*) ———; (*d*) ———; (*e*) ———.

36. The following roofing materials may be had in mixed colors as well as in several solid colors: (*a*) ———; (*b*) ———; (*c*) ———; (*d*) ———; (*e*) ———.

37. Rigid asbestos shingles should last about ———years.

38. A square of roofing consists of ——— square feet.

39. The best materials for flashing are ——— and ———.

40. The material most commonly used for flashing is ———.

41. The best material for gutters and down spouts is ———.

42. If the roof over a house 24 ft. wide rises 6 ft., it must have a pitch of ———.

43. A roof of 1/3 pitch over a house 20 ft. wide, will rise ——— ft.

44. An 8-inch pitch is the same as a ——— pitch.

45. A pitch of 12 inches is the same as a ——— pitch.

46. If a roof over a house 30 ft. wide rises 105 inches, it must have a pitch of ——— inches rise to 1 ft. of run.

47. Hay barns are commonly made with ——— roofs, so as to give more storage room.

48. Sun-baked bricks are called ——— bricks.

49. Cheap backing-up bricks are made by the ——— process.

50. Face bricks are made either by the ——— or the ——— process.

51. A six-brick flue measures about ——— inches by ——— inches on the outside and ——— inches by ——— inches on the inside.

52. A square eight-brick flue measures about ——— inches by ——— inches on the outside and ——— inches by ——— inches on the inside.

53. The following are names of common bonds used in brickwork: (*a*) ———; (*b*) ———; (*c*) ———; (*d*) ———.

54. The following are names of common mortar joints used in brickwork: (*a*) ———; (*b*) ———; (*c*) ———.

55. Bricks that are layed in a wall so that the ends show are called ———.

56. Bricks that are layed flat in a wall so that the edges show are called ———.

57. One layer of bricks is called a ———.

58. Face bricks should be judged for their ——— and their ———.

59. A brick wall backed with tile has the following advantages over the solid brick wall: (*a*) ———; (*b*) ———; (*c*) ———; (*d*) ———.

60. A frame wall that is faced with brick is called a brick ——— wall.

61. Brick for house construction, has the following points of merit to recommend it: (*a*) ———; (*b*) ———; (*c*) ———; (*d*) ———.

62. Make a cross-section drawing that shows the foundation, sill, window section, and cornice construction of a frame house.

63. On the drawing in Question 68, identify the following members: (*a*) rafter, (*b*) ceiling joist, (*c*) stud, (*d*) inside head casing, (*e*) window side jamb, (*f*) parting stop, (*g*) window stop, (*h*) window stool, (*i*) window sill, (*j*) apron, (*k*) baseboard (*l*) base shoe, (*m*) floor joist, (*n*) finish floor, (*o*) rough floor, (*p*) mud sill, (*q*) footing, (*r*) fascia, (*s*) frieze, (*t*) planceer, (*u*) drip cap, (*v*) outside window casing, (*w*) sheathing boards, (*x*) lap siding.

64. Celotex is a by-product of the ——— industry.

65. The lightest wood known is ——— and it is used for making a good wall insulator.

66. The ceiling of a house may be insulated by pouring ——— between the ceiling joist.

67. ——— and ——— are other good insulating materials to use in a wall.

68. Wood used for lath should be both ——— and ———.

69. Metal lath has the following advantages over wood lath: (*a*) ———; (*b*) ———; (*c*) ———; (*d*) ———.

70. Metal lath should be judged for merit upon the following points: (*a*) ———; (*b*) ———; (*c*) ———.

71. The wood laths that are ¾ in. thick, about 5 in. wide and grooved with dovetail grooves are called ——— laths.

72. Plaster has the following advantages over most kinds of wall board: (*a*) ———; (*b*) ———; (*c*) ———.

73. Plaster is usually applied in ——— (number) coats.

74. Plaster is made of ———.

75. The following advantages are claimed for plaster wall board: (*a*) ———; (*b*) ———; (*c*) ———.

76. Stucco mortar is made of (*a*) ———; (*b*) ———; (*c*) ———.

77. Some of the surface finishes for stucco are: (*a*) ———; (*b*) ———; (*c*) ———; (*d*) ———.

78. Metal lath that is to be used under stucco should be ———.

79. Stucco is used most satisfactorily over ——— walls.

80. Stucco can be colored with the following materials: (*a*) ———; (*b*) ———; (*c*) ———.

81. A stuccoed-tile wall has the following points of merit: (*a*) ———; (*b*) ———; (*c*) ———; (*d*) ———; (*e*) ———.

82. Stucco over a frame wall is frequently unsatisfactory for the following reasons: (*a*) ———; (*b*) ———; (*c*) ———.

83. A frame house should be sheathed and building paper placed over the sheathing for the following reasons: (*a*) ———; (*b*) ———.

84. Heavy-timber house framing is called ——— type framing.

85. The lighter plank framing is called ——— type framing.

86. ———, ———, ——— are good woods for house-siding boards.

87. ——— and ——— are the most economical woods for studding, joists, and rafters.

88. ——— and ——— are especially good woods for house flooring.

89. ———, ———, and ——— are woods commonly used for shingles.

90. ———, ———, and ——— are good woods to use for porch floors.

91. Window frames are best made of the following kinds of wood: (*a*) ———; (*b*) ———; (*c*) ———.

92. Rough-faced stone work is called ———.

93. Smooth-faced stone work is called ———.

94. Stone has the following points of merit as a building material: (*a*) ———; (*b*) ———; (*c*) ———; and (*d*) ———.

95. Stone is not commonly used for house construction for the following reasons: (*a*) ———; (*b*) ———; and (*c*) ———.

96. Stone that is to be used in wall construction should have the following qualities: (*a*) ———; (*b*) ———; (*c*) ———.

97. If you wish to borrow money on a house, you must usually give a ——— on the house.

98. Many people save money for building a house by investing in a ——— association.

99. The owner of a house must bear the following items of expense that the renter does not have to bear: (*a*) ———; (*b*) ———; (*c*) ———; (*d*) ———; (*e*) ———; (*f*) ———.

100. The following are some of the larger items in the upkeep of a house: (*a*) ———; (*b*) ———; (*c*) ———; (*d*) ———; (*e*) ———; (*f*) ———.

101. A double-hung window has ——— (number) sash and a casement window has ——— sash.

102. A 24- by 24-in. two light double-hung window has a total opening ——— inches by ——— inches.

103. A frame house should be painted about every ——— years.

104. New outside woodwork should have ——— (number) coats of paint.

105. The ingredients of good outside paint are: (*a*) ———; (*b*) ———; (*c*) ———; (*d*) ———.

106. The priming coat of paint is thinned with ——— and ———.

107. The final coat of paint for outside use should be thinned with ——— only.

108. Painted inside walls have the following advantages over papered walls: (*a*) ———; (*b*) ———; (*c*) ———.

109. Wall paper has the following advantages as a wall covering: (*a*) ———; (*b*) ———.

110. The south rooms of a house should be furnished in ——— colors.

111. The north and darker rooms of a house should be fitted with ——— colors.

112. A residence should be landscaped and planted for the following reasons: (*a*) ———; (*b*) ———; (*c*) ———.

113. The outstanding characteristics of houses of the Dutch Colonial style are as follows: (*a*) ———; (*b*) ———; (*c*) ———; (*d*) ———.

114. The chief characteristics of the New England Colonial style are as follows: (*a*) ———; (*b*) ———; (*c*) ———; (*d*) ———; (*e*) ———; (*f*) ———; (*g*) ———.

115. The chief characteristics of English style houses are: (*a*) ———; (*b*) ———; (*c*) ———; (*d*) ———; (*e*) ———.

116. The following are characteristics of houses of Spanish style: (*a*) ———; (*b*) ———; (*c*) ———; (*d*) ———; (*e*) ———; (*f*) ———.

Key

1. (*a*) Churches and schools; (*b*) pavement and walks; (*c*) proper elevation; (*d*) restrictions; (*e*) trees and shrubs; (*f*) good neighboring property.

2. (*a*) Factories; (*b*) poor transportation; (*c*) rock subsoil; (*d*) lack of utilities; (*e*) noisy streets; (*f*) run-down neighborhood.

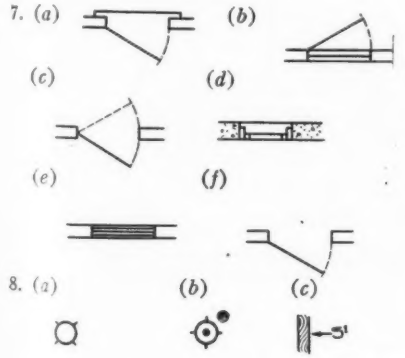
3. (*a*) Modern sink and refrigerator; (*b*) modern electrical appliances; (*c*) storage space; (*d*) good light and ventilation.

4. (*a*) Good ventilation; (*b*) cheerful colors; (*c*) closet room; (*d*) modern electrical appliances; (*e*) space for bed, dresser, etc.

5. (*a*) Proper lighting; (*b*) wall space for buffet, etc; (*c*) pleasant view; (*d*) china storage; (*e*) electrical outlets for toasters, percolators, etc.

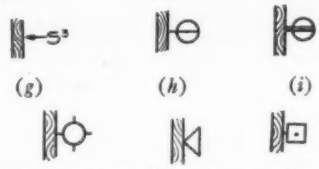
6. (*a*) Medicine cabinet; (*b*) ironing board; (*c*) clothes chute; (*d*) linen closet; (*e*) broom closet; (*f*) closet shelving.

7. (*a*) (*b*) (*c*) (*d*) (*e*) (*f*)



8. (*a*) (*b*) (*c*)

(*d*) (*e*) (*f*)



(*g*) (*h*) (*i*)

9. (*a*) Flat iron; (*b*) sewing machine; (*c*) washing machine; (*d*) sweeper; (*e*) range; (*f*) refrigerator; (*g*) radio; (*h*) lamps; (*i*) toasters and percolators; (*j*) heaters.

10. Clay.

11. Asphalt.

12. Fill along the foundation with gravel, rock, or cinders, and place a drain tile outside the footing.

13. Footing.

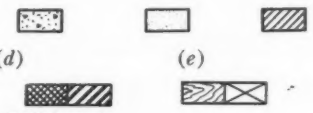
14. Cement, sand, coarse aggregate (crushed rock or washed gravel).

15. 1-2-3.

16. (*a*) Freedom from clay and dirt; (*b*) freedom from organic substances; (*c*) hardness; (*d*) it should be of graduated sizes.

17. (*a*) Hardness and strength; (*b*) nonporous; (*c*) freedom from dirt and dust; (*d*) size varying from ¼ to 1½ in.

18. (*a*) (*b*) (*c*) (*d*) (*e*)



19. Reinforced.

20. Eight.

21. 2¼.

22. 2¼.

23. 2.

24. The flow of gas to the heater is automatically controlled by a thermostatically controlled valve, and it is ignited by a pilot light that always burns.

25. See answers in Table I below.

26. Fifteen, 50.

27. 2/5, 1/3.

28. 4½.

29. Galvanized, copper.

30. Shingle strips, rolls.

31. 15.

32. (*a*) Asbestos composition, (*b*) slate, (*c*) tile.

33. Asphalt composition.

34. (*a*) Slate, (*b*) tile.

35. (*a*) French, (*b*) Spanish, (*c*) Italian, (*d*) Mission.

36. (*a*) Tile, (*b*) slate, (*c*) asbestos composition, (*d*) asphalt composition, (*e*) wood shingles.

37. 70.

38. 100.

39. Copper, zinc.

40. Tin and galvanized iron.

41. Copper.

42. ¼.

43. 6 ft. 8 in.

44. 1/3.

45. ½.

46. 7 in.

47. Gambrel.

48. Adobe.

49. Die and wire-cut.

50. Slop-mold, dry-press.

51. 16 in., 16 in., 8 in., 8 in.

52. 20 in., 20 in., 12 in., 12 in.

53. (*a*) Common, (*b*) Flemish, (*c*) English, (*d*) Dutch.

54. (*a*) Convex, (*b*) concave, (*c*) cut-flush, etc.

55. Headers.

56. Stretchers.

57. Course.

58. Low water absorption, appearance.

59. (*a*) Better resistance against moisture; (*b*) better temperature insulation; (*c*) more durable than a wood-furred wall; (*d*) cheaper than a brick wood-furred wall.

60. Veneer.

61. (*a*) Colorful effect; (*b*) does not require painting; (*c*) fire resisting; (*d*) permanent.

64. Cane sugar.

65. Balsa.

66. Thermofill.

67. Cork, asbestos.

68. Soft, durable.

69. (*a*) Fireproof; (*b*) doesn't expand when wet; (*c*) permits fewer chain cracks; (*d*) prevents corner cracks.

70. (*a*) Rustproofness, (*b*) rigidity, (*c*) weight.

71. Patent.

72. (*a*) Admits many finishes; (*b*) won't warp and buckle; (*c*) has no seams.

73. Three.

74. Gypsum, sand, and lime may be used in the finish coat.

75. (*a*) Will not crack and fall; (*b*) can be easily, quickly, and neatly applied; (*c*) some brands are fireproof.

76. (*a*) Portland cement (*b*) lime (*c*) sand.

77. (*a*) Stippled, (*b*) sand floated, (*c*)

	Initial Cost	Fuel Consumption	Repair Costs	Room Required	Adaptability & Effectiveness	Ventilating Qualities
Pipeless Furnace	Low-about $150 for a 7-room house	Moderate	Low	None in rooms and little in basement	Splendid for small, compact houses	Keeps air in circulation. May be installed to admit fresh air for cir. Moistens the air
Hot-Air Furnace with Pipes	Medium $250	High 13 tons	Rusted pipes may cause some repair	Takes much head room in basement	Suitable for small or large houses	
Steam	High $350	Moderate 10 tons	Reasonable unless corrosive water is used	Radiators must be placed in rooms heated	Suitable for all-size bldgs. Used almost exclusively in large bldgs.	Causes but little circulation and does not moisten the air
Hot Water	Very high $475	Low 7-8 tons	Reasonable unless corrosive water is used	Radiators must be placed in rooms heated	Suitable for large or small houses but not for tall bldgs.	Causes but little circulation and does not moisten the air

Table I. Heating systems

splatter dash, (*d*) pebble dash.

78. Rustproof.

79. Hollow-tile.

80. (*a*) Pebbles, (*b*) sand, (*c*) mineral pigment.

81. (*a*) Permits many colors; (*b*) may be given many finishes; (*c*) doesn't require paint; (*d*) is durable; (*e*) affords good insulation against heat, cold, and dampness.

82. (*a*) Settling cracks; (*b*) cracks due to expansion caused by moisture; (*c*) ignorance of the proper construction.

83. (*a*) Sheathing adds stiffness and strength; (*b*) it makes a good insulating dead-air space.

84. Eastern or full.

85. Western or balloon.

86. Western red cedar, cypress, redwood, and white pine.

87. Yellow pine, fir.

88. Oak, maple.

89. Western red cedar, cypress, white pine.

90. Cypress, white pine, fir.

91. (*a*) Cypress, (*b*) white pine, (*c*) redwood.

92. Rubble.

93. Ashlar.

94. (*a*) Picturesque, (*b*) fire resisting, (*c*) permanent, (*d*) has little if any upkeep cost.

95. (*a*) Too expensive; (*b*) good stone is not always available; (*c*) requires backing or furring.

96. (*a*) Nonporous; (*b*) a good permanent color; (*c*) workable and available.

97. Mortgage.

98. Building and loan.

99. (*a*) Regular tax, (*b*) pavement and sewer tax, (*c*) insurance, (*d*) depreciation, (*e*) remodeling, (*f*) upkeep and repairs.

100. (*a*) Roofing, (*b*) painting, (*c*) papering, (*d*) plumbing, (*e*) heating plant, (*f*) porch floors and sills.

101. 2, 1.

102. 28 in., 54 in.

103. 5.

104. 3.

105. (*a*) White lead, (*b*) white zinc, (*c*) linseed oil, (*d*) turpentine.

106. Linseed oil, turpentine.

107. Linseed oil.

108. (*a*) Some paints are washable; (*b*) paint can be applied easily by the householder; (*c*) they can be cheaply recoated.

109. (*a*) It is available in many beautiful patterns and color combinations; (*b*) has a soft pleasing surface.

110. Cooler (gray, green, blue).

111. Sunny (yellow, red).

112. (*a*) It is a good investment; (*b*) affords a screen; (*c*) affords beauty and shade.

113. (*a*) Low overhanging eaves; (*b*) gambrel roof; (*c*) wide dormers; (*d*) divided windows.

114. (*a*) Simplicity; (*b*) shutters; (*c*) rectangular plan; (*d*) divided windows; (*e*) narrow cornice with gable returns; (*f*) outside fireplace; (*g*) classic details on the entrance.

115. (*a*) Sharp gables; (*b*) sharp dormers; (*c*) irregularity in plan; (*d*) narrow casements; (*e*) half-timber construction.

116. (*a*) Heavy masonry walls; (*b*) stuccoed walls, inside and out; (*c*) arches; (*d*) uneven floor level; (*e*) balconies; (*f*) tile roofs.

Problems and Projects

PLANER VISE

W. A. DeVette, Erie, Pennsylvania

(*See Tracing on page 379*)

The planer vise presented herewith belongs to a series of drawing problems, each of which represents a complete article with which the students in the machine shop are acquainted.

It is an excellent problem in machine drawing for advanced pupils as it involves many principles of construction and operation, use of standard parts, finish, tolerances, and the like.

The instructor may draw upon his own experience as to the desired related information to be imparted.

TRANSFERRING THE DESIGN TO THE LINOLEUM BLOCK

John Czerniewicz, High School, Carterel, New Jersey

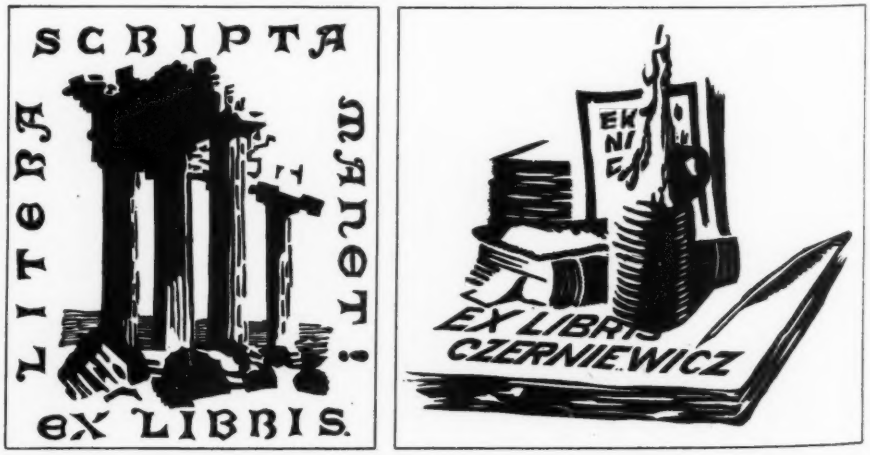
Cutting single or multicolor linoleum blocks for school magazine covers, illustrations, posters, or greeting cards, makes fascinating work or an absorbing hobby, besides being most instructive and educational. Since it is an inexpensive means of reproducing certain types of design in black and white or in color, it is being used in many school print shops, frequently in collaboration with the art department.

However, satisfactory transfer of design to block, especially in color work, is frequently a problem, present methods leaving much to be desired in accuracy for purposes of register, in durability to withstand handling while cutting the block, and in simplicity and facility of getting the design on the linoleum. Adaptation of the hectograph duplicating method as described in the following paragraphs provides a means of getting identical outlines of the design on several blocks in a simple, legible, durable form.

Materials needed for this method are hectograph gelatin compound (sold in one-pound cans in office-supply stores; one pound is enough); a piece, or pieces of flexible cardboard, with a rough surface to which the gelatin will adhere; a sheet of hectograph carbon paper; the design, drawing, or tracing on typewriter bond or "Ditto" paper; a hard pencil, and a smooth, hard drawing surface. The idea is to make a flexible gelatin pad on which the design is reproduced through contact with a reversed hectograph carbon copy and from the gelatin transferred to as many blocks as necessary.

To make the pad, the gelatin is melted in a double boiler and applied to a previously roughened surface of the cardboard with a brush, flowing the liquid on to a smooth layer about 1/16 in. in thickness. Do not apply a heavier coating as this may introduce distortion when the design is transferred, due to the plasticity of the compound. Allow the gelatin to cool, and set for about an hour in a cool place. Then trim the pad to the size of the linoleum block, allowing an inch oversize in length for handling. A strip of paper pasted to the gelatin on this extra inch will make handling easier.

The design is prepared for transfer by placing under it a sheet of hectograph carbon paper, coated side up, and going over the design with a hard pencil to get a reverse picture on the back of the paper. Best results are obtained if this is done on a hard surface such as metal or glass, although a drawing board is quite satisfactory. Color areas in multicolor designs may be indicated by cross-



Bookplates printed from blocks made by the hectograph method

hatching in various directions for the various colors.

Frame the reversed carbon copy with a pencil border so that the gelatin pad may be properly centered. Now put the gelatin in contact with the hectograph carbon copy, being sure that no air bubbles or wrinkles are present and using very light pressure to establish close contact. After about one minute remove the gelatin pad from the drawing slowly and carefully; the design will show clearly on the surface of the gelatin.

To use the pad, simply place it on the block in line with the edges; eliminate air bubbles by starting at one end and rolling the pad on toward the opposite end until full contact is established. Remove almost immediately and repeat on the next block for as many as are necessary. The design should show a bright purple, sharp, distinct, line. After a few moments of drying this will be durable enough to withstand scrubbing with soap and water without fading. After a day or so, the design will sink to the bottom of the gelatin and the pad may be used again for another block.

Use ready-prepared linoleum blocks with a surface of white paint or enamel. Sand them lightly with 2/0 sandpaper to remove the gloss before proceeding.

ELECTRIC ENGRAVING PEN

Byron M. Taylor, W. Wilson Jr. High School, San Diego, California

The advantage of having the student of electricity build a tool such as this engraving pen is that it fixes in his mind some of the more important principles of his subject. Such principles are: That a magnetic field accompanies current flow; that iron in a magnetic field tends to arrange itself so as to shorten the magnetic circuit; that a rising and falling current results in a rising and falling magnetic-field strength, and so forth.

Hand tools suffice to do the work, and the materials are found in the stock of most school shops.

Figure 1 presents a full-scale side view of the finished pen. Figure 2 shows how the pen is held when in use.

The frame is constructed of ½- by ½-in. band iron by bending to the shape shown in Figure 3. As this is a full-size side view, it may be used to check the correctness of bending the material for the frame.

Cut off a piece of band iron 12 in. long. At a distance of 5¼ in. from one end make the bend marked *A* in Figure 3. To do this, the iron should be heated to redness at the bending point. When heated, quickly place in a vise and turn at right angles. Heat the bend again and close up tight in the vise as shown at *A*. The other bends necessary to attain the finished shape can be made cold in the vise with a hammer. Make the bend *B* last, because the rubber hand grip should be in place before this bend is completed. The grip is 3½ in. of stiff rubber tubing of about ⅜-in. inside diameter. When the bending is completed, cut off the surplus iron at each end. File a small flat at *A*, on the top of the bent portion that is to form the core of the magnet.

Drill the holes as shown in Figure 3, and tap the 9/64-in. hole for an 8/32 machine screw. Put the hack-saw cut in the foot as shown, and file or grind the scribe-bearing foot approximately to the form shown. The frame is now complete.

From the same band-iron stock, make the armature and screw holder shown in Figures 4 and 5. Drill the holes as indicated. Tap the 9/64-in. hole for an 8/32 machine screw, and shape and bend the parts as shown, using a hack saw and file.

Next, cut off two pieces of No. 24-gauge ½-in. blued clock-spring steel by catching the correct length in the side of the vise and snapping off short with the blow of a hammer. See Figure 6. The two pieces of spring steel are to be riveted together later to act as one spring. Bend the steel to the shape shown in Figure 6.

Clock-spring steel is hard, and cannot be drilled in the ordinary way. So, take about 8 in. of ½-in. band iron and drill about eight 9/64-in. diameter holes along it. This forms a die to aid in punching the holes in the steel. Lay the prepared band iron on an anvil or vise. Center punch the pieces of spring for the holes and adjust one of the pieces over the die so that a punch mark corresponds with a hole beneath. Then, with a blunt center punch and heavy hammer, drive a piece of the steel through the hole. Put the two end holes into the two springs, but do not punch the central holes until the springs have been assembled on the frame and it is seen just where the armature must hang so that its rear portion will not hammer against the frame as the armature vibrates. A little over 1/16-in. clearance between the armature and the frame is about right. Study the proper position of the armature and (through the hole in it) mark the springs so that they may be center punched and die punched. This done, the armature and spring may be riveted together with a ⅛-in. diameter rivet. Grind the notch into the end of the springs as shown in Figure 6.

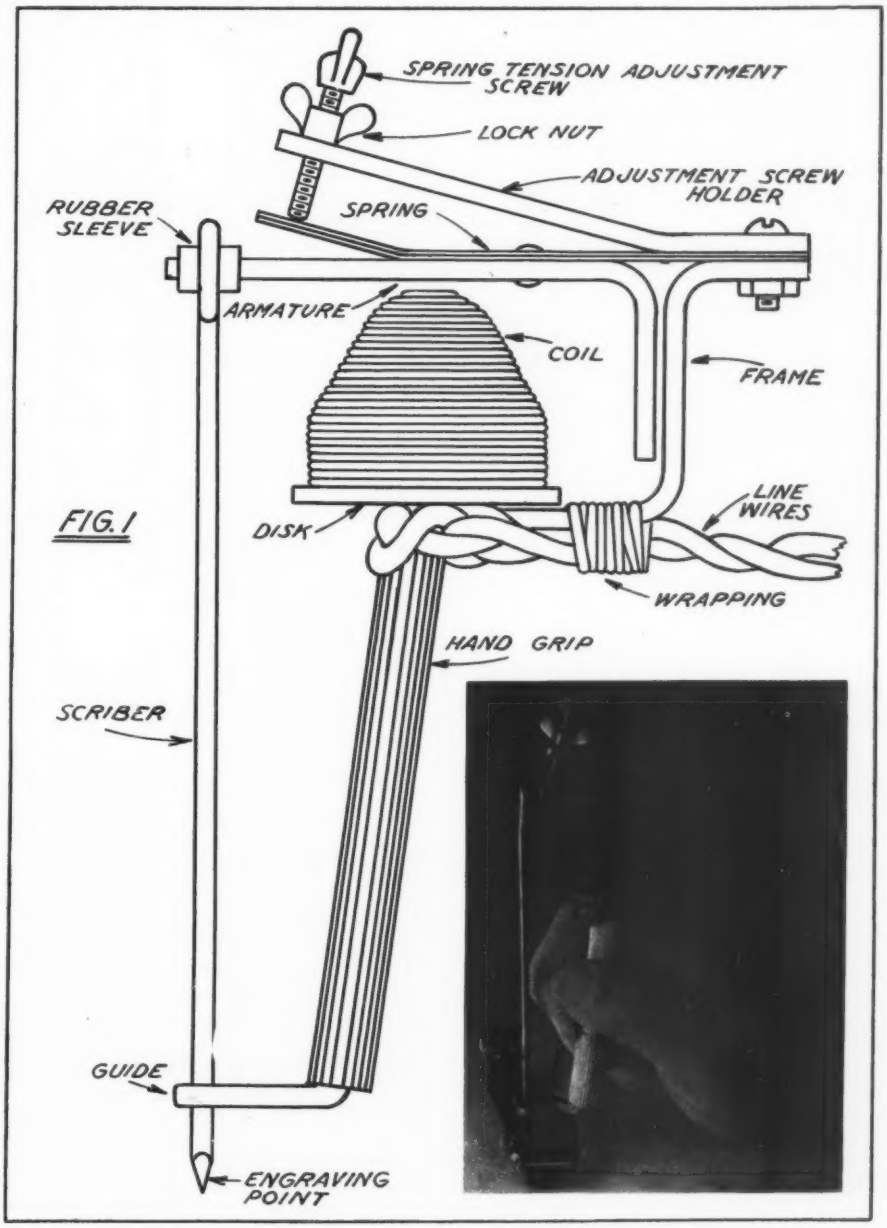
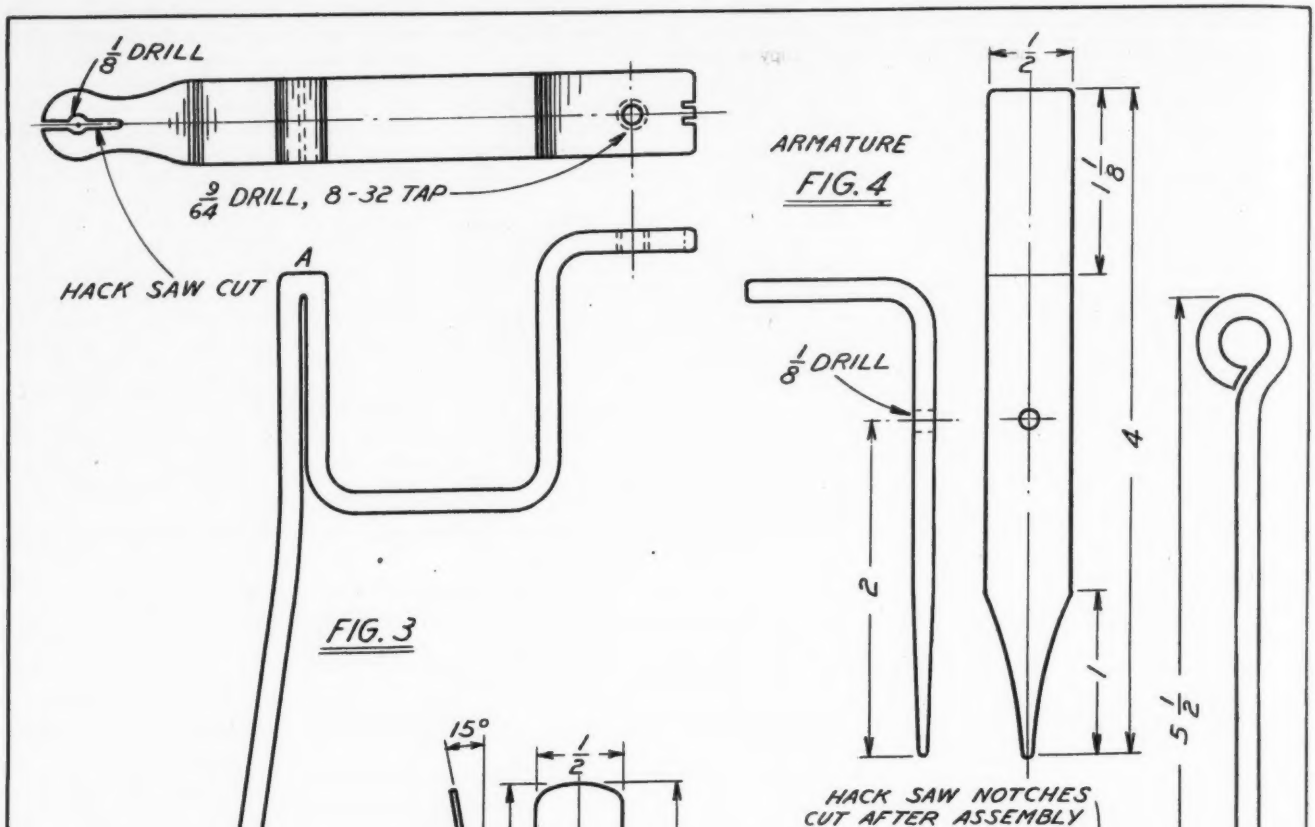


FIG. 1



Fix the spring and screw holder on the frame with a brass machine screw (8-32) and notice that this does not prevent the assembly turning on the frame. This turning may be prevented by cutting notches into the holder as shown in Figure 5 on the ends of the pieces, putting the combination of screw holder, spring, and frame in a vise, and hammering the center tongue left by the hacksaw with a blunt chisel until it locks into the notch in the frame.

The scriber, which carries the cutting point, is made of ⅛-in. drill stock (see Figure 8). Cut a piece about 6½ in. long. Bend the eye in the vise. With the jaws of the vise about ⅛ in. apart, insert ¾ in. of the drill rod and make a bend to the extent possible. Use the drawing, Figure 8, for a template. Bend the neck before closing the eye. Put the partly formed eye in the vise, and finish it by closing the jaws.

Grind the other end to a blunt pyramid with a clean cutting point. Heat the point to a cherry red in the gas flame, and harden it by quenching in water.

The energizing coil is wound on the doubled part of the frame called the core. To support the coil at one end, cut a piece of fiber 1½-in. in diameter with a central opening as shown in Figure 7. This permits the disk to be slipped to the bottom of the core as shown in Figure 1. Now, cover the core with strips of friction tape. Drill two 1/16-in. diameter holes as indicated in Figure 7. The coil consists of 32 feet of No. 20 D.C.C. magnet wire. With the disk in place, thread an end of the wire downwards through the hole that is near the center of the disk. Begin winding and, when the top of the core is reached, "bank" for the return layer and so get as much wire as possible on the core consistent with no slipping of the turns. See Figure 1.

At the completion of the winding, double thread the finishing end through the outer terminal holes so as to emerge on the under side of the disk.

Attach the line wires to the ends of the coil, soldering the joints. Knot the line wires around the frame just under the disk before bringing them back and tying them to the frame with twine.

The spring-tension adjustment screw is an 8-32 brass machine screw having a brass wing nut fixed to the head with solder. Another wing nut on the screw serves to lock the adjustment. Put the screw in position in the holder as seen in Figure 1, and adjust it to bear on the point of the spring. In use, the armature must not touch the head of the core but be about 1/16 in. away from it.

Slip a ¾-in. piece of ⅛-in. diameter rubber tubing on the armature point. Slip the scriber through its bearing hole in the foot of the frame, and press the eye over the rubber covered point.

This completes the pen, which is designed to work on 6 to 8 volts of alternating current obtained from a stepdown transformer attached to a source of commercial current.

The pen may be used for engraving metals, jewelry, wood, fiber, celluloid, leather, synthetic resins, and the like.

SHIP MODELS WITH CHROMIUM SAILS

William Duke III, High School, Ardsley, New York

During the past year, chromium ships have become quite a rage in some sections of the country. They are being incorporated into all kinds of novelties such as book ends, ash trays, and table ornaments.

The original model which combines a plain black-wood hull and mast, with chromium-plated sails, has been elaborated on to a great extent by the students. Several have worked up detailed models with decks, railings, and cabins which, when set off by chromium sails, are most effective. A model of this sort also may be used on a silhouette lamp.

We found that very thin 18 by 30-in. sheet metal, chromium plated on only one side, could be obtained at a cost of $1. This is enough to make seven sets of sails for the 7-in. models.

This sheet chromium can be put to innumerable uses in the general shop. It may be used to decorate small projects, and it may be substituted for sheet copper to good advantage for it will not tarnish. We have found that a sheet of it makes a first class squeegee plate for photography work. It may also be used as a mirror for the medicine cabinet as the surface is so perfect that it may easily be substituted for a glass mirror.

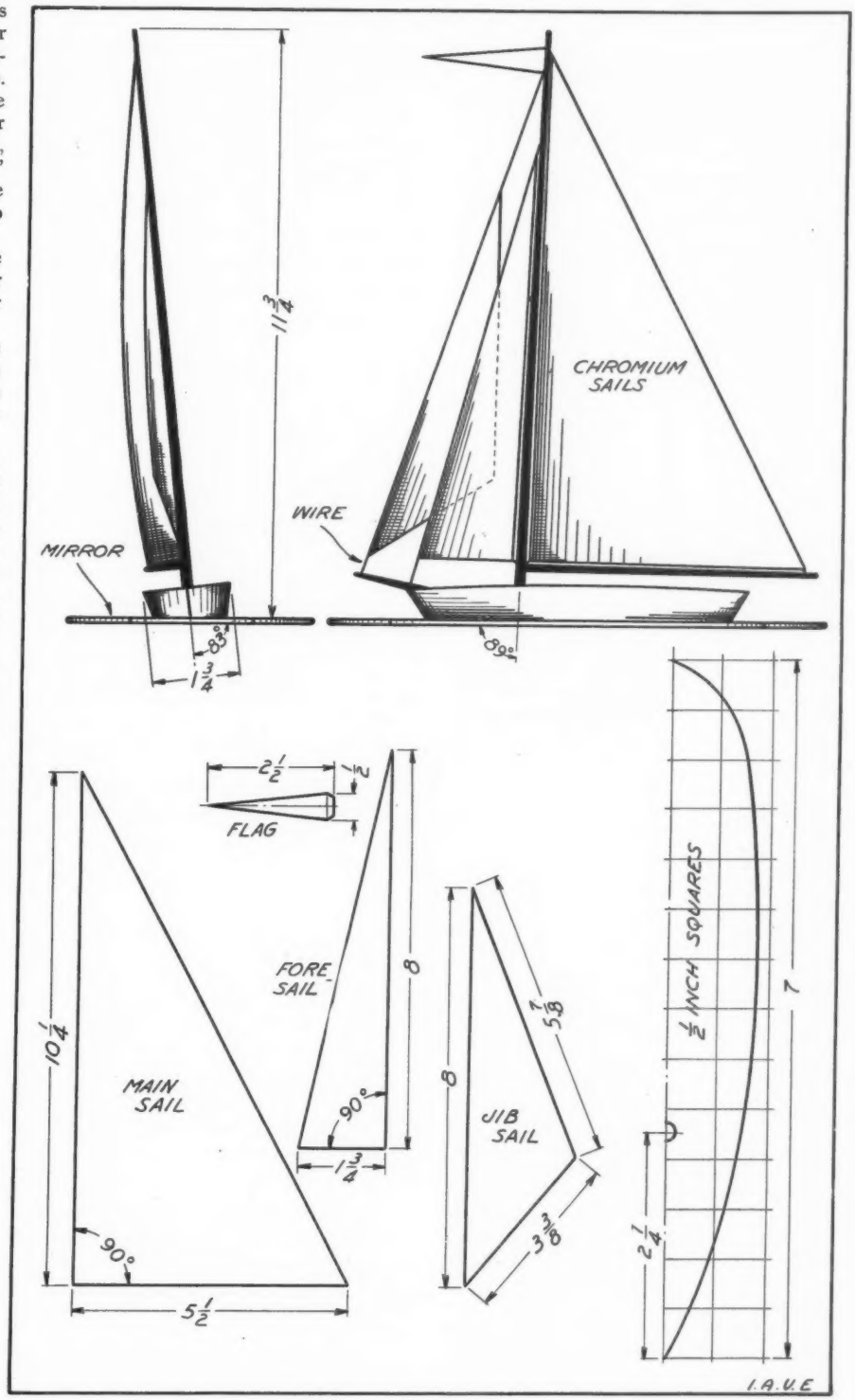
Materials:

Sheet chromium, soft pine, dowels, black enamel, wire, small mirror.

Tools:

Jig saw, tin snips, pliers, prick punch, hand drill, sandpaper, paint brush.

Operations: Hull, 1 pc. ¾ by 1¾ by 7 in., clear white pine.



Details of ship models with chromium sails

1. Make a pattern of the hull as shown on the squared drawing.

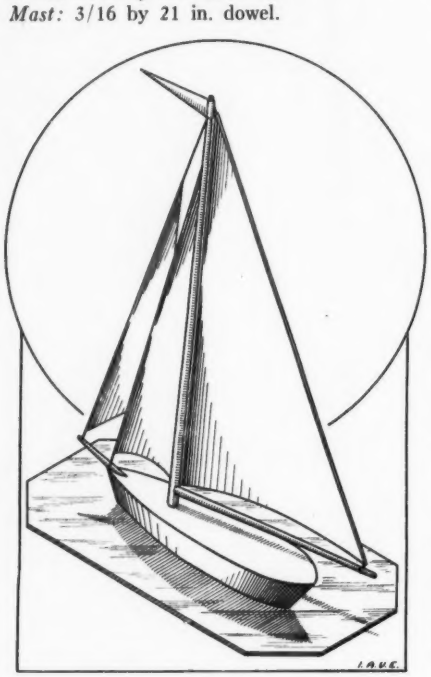
2. Trace the design on a block of wood and cut out on a jig saw or on a band saw, with the table set at an angle of 11 deg.

3. Change the angle to 30 deg. and recut the stern or rounded end of the hull so it has a deeper slant.

4. Place the boat top down in a wedge on a bench and plane the bottom. Plane one side more than the other to give the ship a slight list when it is finished. A "list" or tilt of 7 to 8 deg. will give the finished ship grace without causing it to tip over too easily.

5. File and sandpaper the hull smooth and it will be ready for the mast.

Mast: 3/16 by 21 in. dowel.



6. Pick out a straight 3/16-in. dowel, and taper 11 in. of one end with a plane. The taper should be from 3/16 in. to ⅛ in.

7. The boom consists of a piece of dowel rod 6 in. long, tapered from ⅛ in. at one end, down to 3/32 in. at the other.

8. The bowsprit is made 2 in. long. It is tapered from 3/16 in. to ⅛ in.

9. The mast is stepped 2¼ in. from the bow. A 3/16-in. hole should be drilled at this point at a slight angle so that the mast leans toward the stern.

10. The bowsprit is beveled on the large end so it will fit flat on the deck and extend 1¼ in. over the bow.

11. Glue the mast and bowsprit in place.

Finish: The type of finish used on the hull may vary as to color but should produce a glossy tone in preference to flat. Black or midnight blue in enamel or lacquer will produce a striking effect with the chromium.

12. Sand all parts smooth and apply a coat of shellac.

13. When this is dry, rub it smooth, and the model is ready to be finished in the color chosen by the maker.

Sails: 1 piece of thin sheet chromium 5½ by 10¼ in.

14. Make a paper pattern of the sails following the dimensions on the drawing.

15. Use these patterns to lay out the sails on the chrominum sheet. A scratch awl can be used to mark on the chromium. Care must be taken not to scratch the surface of the sail. If the sheet is plated on one side only, be sure to place the pattern on right side up or the wrong side of the metal will show on the ship.

16. Cut carefully on the lines with tin snips.

17. The sails are rigged with fine wire through holes punched in the sails and drilled in the mast and boom.

18. The boom is fastened to the mast with a small brad through the mast into the end of the boom.

19. Finally bend the sails a little to give the appearance of a ship before the wind. A small mirror makes an excellent base.

SAFETY RULES AND A PASS CARD

George H. Carroll and Alvin W. Westerhouse, South Junior High School, Joplin, Missouri

A specific set of rules has been developed for each of the machines in our woodworking shop, and no student is permitted to use any of the machines until he has obtained a pass card showing that he knows how to properly use the machine.

In order to secure a pass card, the student must pass a test showing that he knows the rules, and he must have individual instruction by the instructor in regard to the operation of the machine.

The fact that the machine may not be used unless he learns about it, causes the student to study from his own free will. This in turn prevents accidents caused by using a machine in an improper way.

The rules are posted beside the machines where they may be read at any time other than when a test is being given.

After a student has secured his pass card, he is held strictly accountable as to the correct use of the machine. At any time that any of the rules are not observed, he may have his pass card revoked by the instructor.

This is to certify that

.....

has learned the rules regarding the machine and has used the machine under special supervision of the instructor. He is, therefore, entitled to use the following machines:

1. Universal saw
2. Jointer

This card is revocable at any time.

.....

Rules Regarding Universal Saw

1. Everyone using the machine must have a pass card.

2. Do not talk to anyone while using the machine, and do not startle or talk to anyone when they are using it.

3. Stand so that you will not slip.

4. Always use a fence.

5. Start the saw and let it come up to speed before sawing.

6. Be careful to hold piece straight, so as not to bind the saw.

7. If anything goes wrong throw the switch at once and notify the instructor.

8. Be safe. If not sure, ask the instructor.

Rules Regarding Jointer

1. Everyone using the machine must have a pass card.

2. Do not talk to anyone while using the machine, and do not startle or talk to anyone when they are using it.

3. When using the machine stand so that you will not slip.

4. Do not try to plane a piece under 12 in. in length.

5. Never use the machine without the guard.

6. Be sure that the fence is square with the table.

7. Always let the machine get its maximum speed before using, and do not take too deep a cut.

8. If anything goes wrong throw the switch at once and notify the instructor.

9. Be safe. If not sure ask the instructor.

SHAPER WORK ON THE CIRCULAR SAW

R. M. Kindred, Director of Vocational Education, Colorado State Industrial School, Golden, Colorado

Many instructors of small shops have said, "If we only had a shaper, the boys could turn out so much better work on their furniture projects." This is very true and the addition of a shaper to the small shop undoubtedly would do much to stimulate interest on the part of the boys taking the woodworking courses. But, shapers are quite expensive and there is a certain amount of danger connected with their operation so that many school boards are averse to installing them.

If the shop is equipped with a circular saw which has either a cross-cut or combination blade, certain types of shaper work can be done on it provided the pieces to be shaped or edged are rectangular, or have straight sides. Mr. Charles Foulk, woodworking instructor at State College of Education, Greeley, Colo., showed me the basic idea for doing this little trick, and we have developed this idea to the point of applying it to a diversity of projects. Some very creditable pieces of furniture have been made, and, although the method is much slower than that of the regular, high-speed shapers, pleasing effects may be obtained with very little effort in hand-finishing the work.

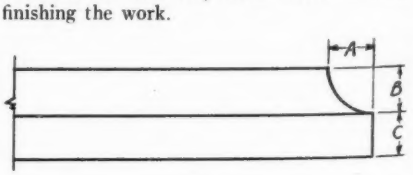


Fig. 1

A word of caution is given here because the job is not one for an amateur such as the beginner in the school shop. The worker must be very careful not to crowd the saw in running material through.

The first thing to be done, of course, is to determine the design of the edge to be made. The simplest and easiest to make is the coved effect shown in Figure 1. In setting

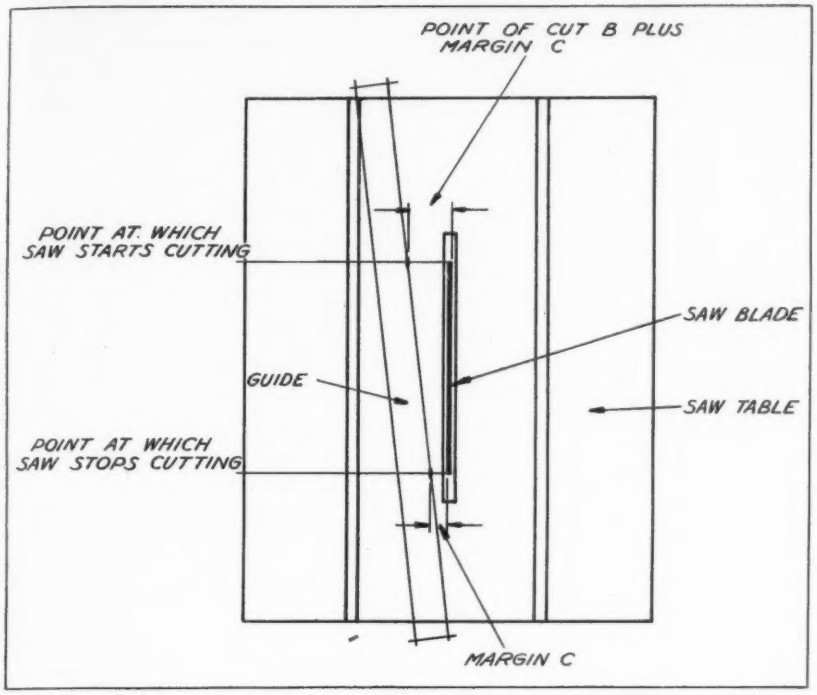


Fig. 2

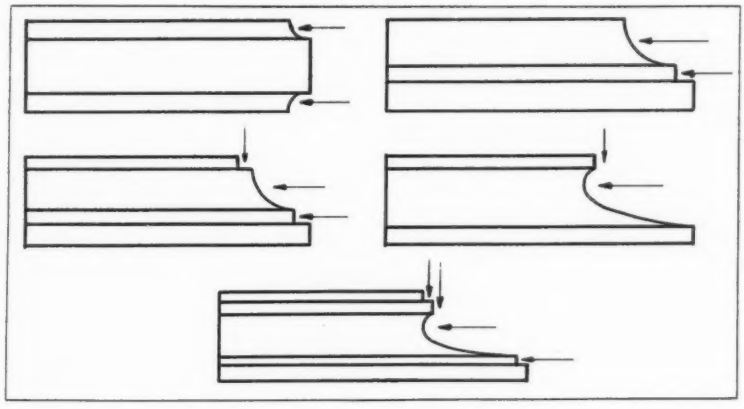


Fig. 3

up the saw for this coved effect, set the table to the desired depth of cut as at A. See also Figure 2. Start the saw and move a scrap piece of wood toward the saw gently until it just barely begins to cut. Turn off the power holding the piece of wood steady until the saw stops turning. Mark a line along the edge of the wood at the point where the saw just cuts, on the saw table, and to the *left* of the saw blade. Measure from the *left* side of the saw blade a distance equal to the margin you wish to leave to the cove cut as at C in Figure 1. Mark this point on the saw table, on the line just made, because one end of the guide will rest over it.

Next, start the saw again and move the piece of scrap wood toward you on the back side of the saw until it barely begins to cut or touch the revolving blade. Turn off the saw, holding the piece steady until the saw stops turning, and mark a line as you did on the front side. Measure over on this line from the *right* side of the saw blade a distance equal to the *width* of the desired cove cut *plus* the *margin* allowed above, and mark this point on the saw table.

The next step is to set the guide which may be a piece of 2- by 4-in. or 3- by 3-in. lumber. The 3- by 3-in. is better as it gives more bearing surface to support the material to be shaped when pushing it through the saw. Place the guide with the edge nearest the saw directly over the two points just located and clamp it in place with C clamps.

The saw is now ready for the roughing-out cuts. A scrap piece of material should be used to verify the settings of the saw and guide, raising or lowering the table and shifting the guide sidewise as necessary. Push the wood through until the saw blade begins to bend to one side slightly. From this point on, the wood must be alternately lifted and pushed straight down on the saw all the way across one side or until you have roughed-out one side. After roughing out the side, the piece may be pushed through without bending the saw blade sidewise, and this second time through will clear up the saw marks remaining from the roughing-out cut. Go all the way around the piece, first roughing-out and then taking the finishing cut. To obtain a still smoother finish, set the saw a trifle deeper and move the guide toward the saw just a tiny bit, run the work through again, and you will have a very respectable piece of shaper work on which but little hand work will be necessary in smoothing up. Round, half-round, and flat cabinet files and sandpaper should be used for the final smoothing operation.

With a little practice and experimenting, one can become proficient in this sort of improvised shaper work, and numerous designs will suggest themselves as one becomes more familiar with the method. We have worked out a number of "glorified" cutting boards and other pieces and the boys virtually "eat them up." The old, fundamental operation of squaring up stock takes on new significance when the boy knows he can make a much better appearing piece with the expenditure of a little additional effort on the squaring-up process.

In Figure 2, a few suggested designs are shown beginning with the simplest, the cove, and progressing to some that are more intricate. After one becomes familiar with the setting of the saw, the time necessary to make the various shapes can be cut to a minimum, and, of course, much better work will be accomplished.

The arrows in Figure 3, indicate the direction from which the saw should feed into the work, or from which the saw cuts should be made. End-grain cuts should always be made first, as the saw has a tendency to tear when it leaves the wood. The succeeding side cuts will clear up any mars that occur when the saw leaves the wood on the end-grain cuts. Hollowing-out, or cove, cuts should be made after the margins have been sawed.

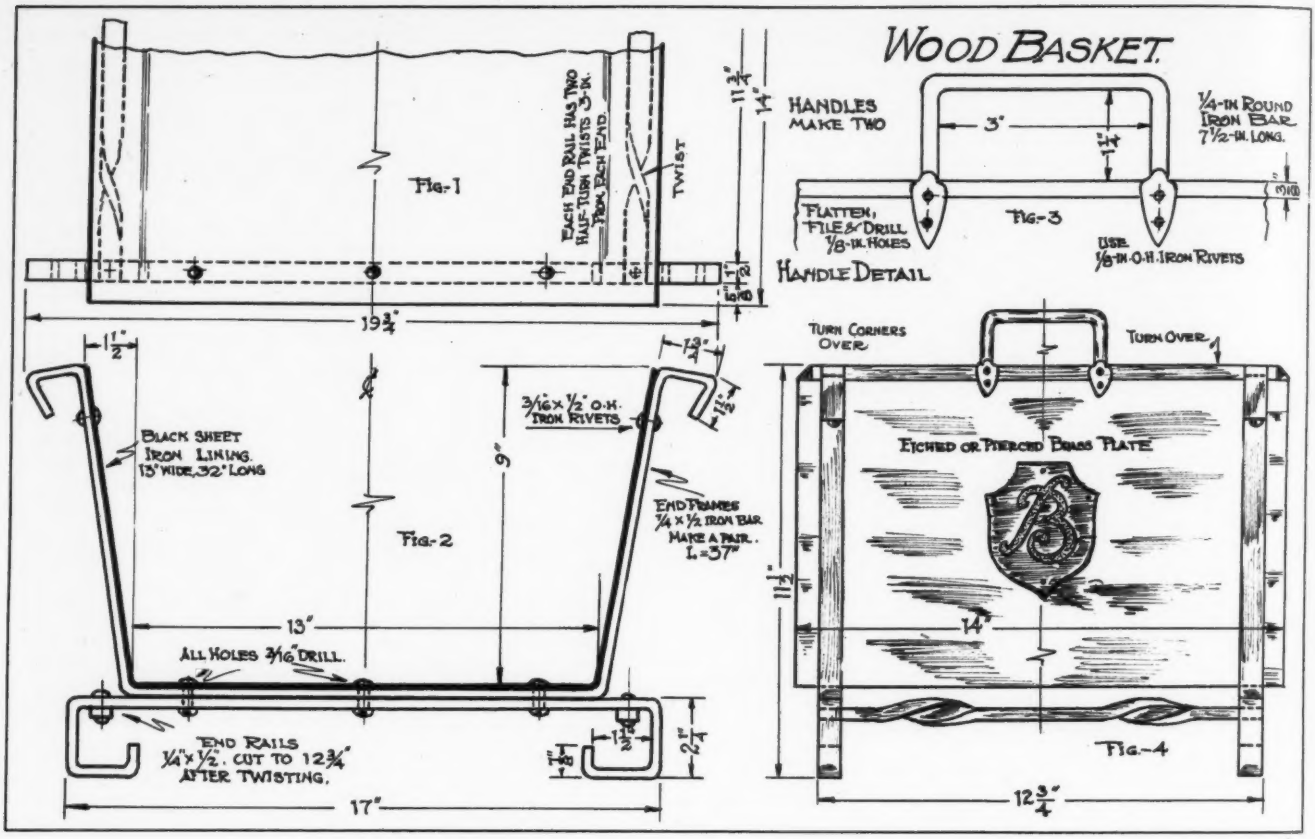
THE WOOD BASKET

Gerald A. Boate, Seattle, Washington

The wood basket is another fireside companion that looks well and is both desirable and durable. The open-grate fire is at its best when the smoke wreaths curl upward from birch, beech, or maple second-growth wood. The basket herewith described was designed to harmonize with the other pieces of the fireplace set which have already appeared in the INDUSTRIAL ARTS AND VOCATIONAL EDUCATION MAGAZINE.

The basket consists of two easily formed end frames which are shown in the end view of Figure 2. These are tied together by two end rails which are shown in Figures 1 and 4. This framework is lined with heavy, black, stovepipe steel. All of the parts are tightly riveted using 3/16-in. diameter oval-head iron rivets. The two handles are formed of ¼-in. round steel. They are riveted in place as shown in Figure 3 using ⅛-in. diameter black oval-head rivets.

The etched piece, or end plates, lend distinction to the design and make it exclusive. The etching should be of brass or copper. The design thereon may be an initial, monogram, crest, or any simple distinctive design. The object of the etched plates is to form a center



of interest and give individuality to the wood basket.

Construction

The Feet: Begin by making the feet, shown at the bottom of Figure 2. Cut two pieces of ¼- by ½- by 26½-in. bar steel. Heat the ends red hot and forge over a one-inch square iron bar held in the vise jaws. Keep matching the two pieces so that they will be the same.

End Frames: The end frames, Figure 2, require two pieces of ¼- by ½- by 37-in. steel bar. Center punch the middle of each bar and work from this reference point. Heat the bars and make a right angle bend at both ends of each bar, 6½ in. from the center mark. Match the pieces and make the parts that stick up all of equal length. Now forge the turned over ends following the dimensions given. When the shape is satisfactory the frames should be reheated at the 90-degree bend and flared outward 1½ in. This operation may be checked using a steel square and a rule.

Cross Bars: The end rails or cross bars each have a half-turn twist. The twist begins three inches from each end. In addition to improving the appearance the twists stiffen the bars. The twisted bars are shown in Figure 4. Cut two pieces of ¼- by ½- by 14-in. mild steel bar. After the bars are shaped, fit them to the basket, and then cut off the excess metal at each end.

Lining: The basket lining is made of black heavy-gauge stovepipe steel. A piece 13 by 32 in. will be needed. The narrow ends are folded over ½ in. carefully and pounded down smoothly to give a safe edge. The corners should be turned over ½ in. also. This lining is then bent to fit the end frames. The folded over edges may be done using a bar folder or over the bench edge using a wooden mallet for pounding.

The Handles: Two handles are needed. Use ¼-in. round steel bar. Cut the pieces 7 in. long. Flatten the ends as shown in Figure 3. File or grind these to the shape shown. Form the 90-degree bends in the vise.

Drilling: Use a 3/16-in. drill for all holes. Use chalk and a center punch for accurately locating drill centers. First drill the five holes shown in Figure 2 in each of the foot pieces. The three inside holes are marked up through the holes onto the bottom of the end frames which should be rubbed over with chalk. The holes in both parts must be in alignment as the lining, end frame, and foot of each end are riveted together.

Riveting: The lower rivets are 3/16 by ¾ in. and the side rivets are 3/16 by ½ in. The rivet heads should be on the inside. Use end cutting wire cutters to remove the excess length. In riveting use a rivet set held vertically in the vise jaws. Use the ball end of a machinist's hammer for setting down the ends. Pound lightly around and around the shank then set it down with another rivet set so that the shank will look the same as the head. The four rivets used in the upper end of the lining and also the four used in the end rails are treated in the same manner.

The holes in the handles are ⅛-in., hence use ⅛-in. oval head rivets.

The End Plates: The end plates make the basket distinctive. Their design calls for some individuality. Their size and shape should be in keeping with the basket design. In order to have them uniform two patterns should be cut out using two sheets of paper doubled. The hinge edge of the paper may be considered as a center line so that it is only necessary to pencil in one half of the outline. A pair of scissors will form the other half. These patterns are used only for cutting out the metal to which they are pasted.

The sheet brass or copper used should be about No. 20 B. & S. gauge free from all scratches and handled carefully. If the design selected is to be etched a simple method is described in the January 1934 issue of INDUSTRIAL ARTS AND VOCATIONAL EDUCATION MAGAZINE, page 22. However, should saw piercing be preferred it may be quickly done using a jeweler's saw, or faster still a jeweler's saw blade in a power jigsaw. Attach the end plates to the basket with small brass rivets.

All of the metal parts should next be thoroughly cleaned using steel wool. Polish the end plates with brass polish and wash them off in hot water. When they are dry, lacquer them. Paint all of the other parts of the basket, both inside and out with two coats of flat black brushing lacquer. When dry the surfaces may be thoroughly waxed using a good quality of floor wax.

The basket when completed weighs seven pounds. It may be carried right out to the wood pile for cleaning and refilling. The project is a ten-hour job and the material cost is approximately 65 cents.

OCTAGONAL TRAY

William J. Becker, Boynton Junior High School, Ithaca, New York

This tray, octagonal in shape, may be made of either copper or aluminum. It makes a very effective decoration for the table as well as being useful from the standpoint of utility. The most important item in its making is its careful forming to shape.

Materials required:

1 piece of No. 22-gauge copper or No. 18-gauge aluminum, 5½ by 5½ in.

Directions:

1. Make bill of material and have instructor approve.
2. Cut material to size (5½ by 5½ in. square, not octagonal).
3. If copper is used, anneal by heating to a red heat and quench in water; if aluminum, see instructor.
4. Locate center of stock as in Figure 1 by drawing diagonals. Use a pencil for doing this. Next, draw a *light* circle 4 in. in diameter with a pair of dividers.
5. Get raising block of correct size; check with instructor.
6. The scribed line of circle must always be directly over hole in block. Make sure of this by making pencil marks around the four sides of the block, to serve as guide lines.
7. Start forming copper to shape, as shown in Figure 2. Be careful of the following:

a) Check type of hammer with instructor.

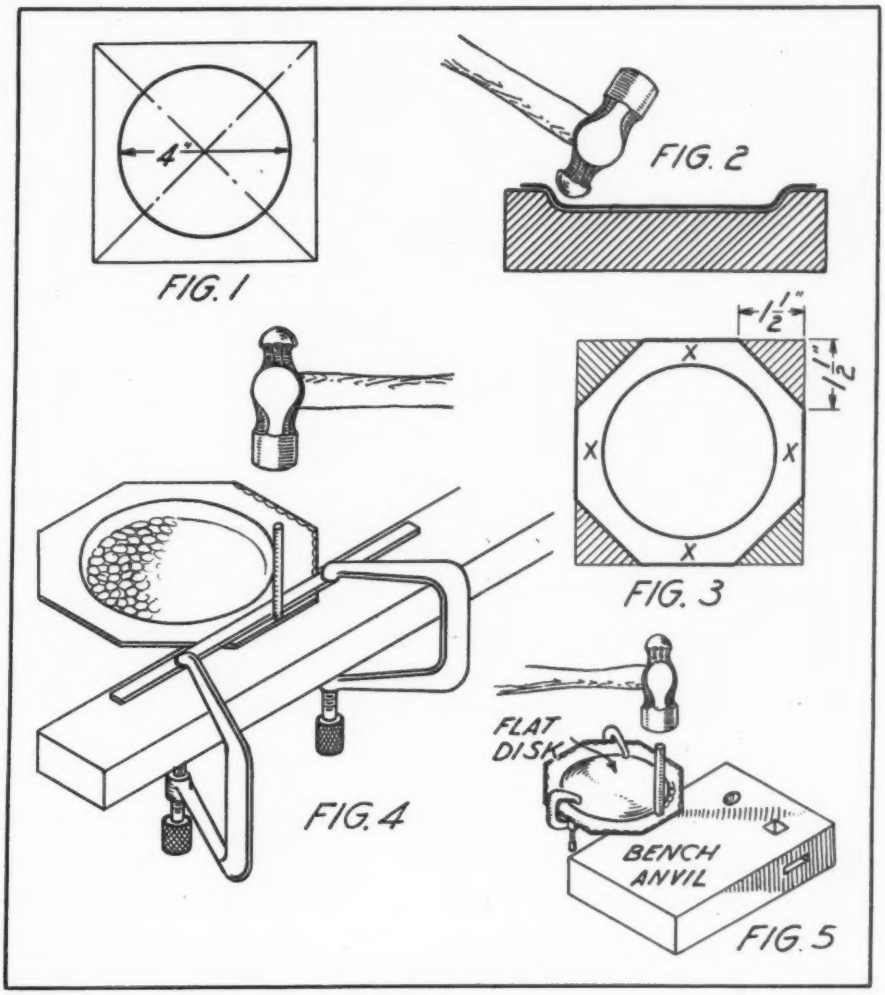
b) Keep edge of tray flat, using mallet for this.

c) Strike only near edge of tray. The blow should be struck toward you with hammer held at angle shown in Figure 2.

d) Work around edge of tray gradually. *Do not* try to drive it into place in a few turns.

e) As the metal gets harder through pounding, keep annealing as in step No. 3.

8. When tray is smooth and formed to shape as much as possible in this block, it may be deepened still more. An iron forming block will be needed for this.
9. Place in iron form and work the same way as before. Check form, hammer, and mallet with instructor.
10. Peen inside of tray. For this, select hammer producing the size marks that you want. Peen on flat stake.
11. Reshape bottom on form or with mallet, if necessary.
12. Tray is now shaped as in Figure 3. Check all four sides marked by an X. They should be equal in size, as well as straight for their entire length. If not, cut them this way.
13. Lay off corners as shown in Figure 3.
14. After instructor checks the layout, cut off the corners.
15. Clamp straight piece of sheet metal of thick gauge about the length shown in Figure 4 to one edge of the work. It should be 3/32 in. from the edge.
16. Get correct punch from instructor; punch design around edge of tray as in Figure 4. If you have never performed this operation, have the instructor show you.
17. Secure a disk of correct size from the instructor and clamp in position on tray as shown in Figure 5. Place the tray overhanging



FOR YOUR BULLETIN BOARD

POSTER 87 **NOVEMBER, 1937**

MAKING DECISIONS

The ability to make wise decisions may be developed by learning to weigh and consider thoroughly, all the facts that surround a problem and then come to a carefully thought-out conclusion.

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Submitted by Professor L. M. Roehl, Cornell University, Ithaca, New York

the edge of the flat anvil and punch design around the bowl-shaped part of the tray.

18. Clean project by dipping in acid solution until most of the dirt is removed.

19. Clean remainder with steel wool; avoid smudging with fingerprints.

20. If job is to be polished, do so on buffing wheel.

21. If it is to be colored (on copper only), put into a liver-of-sulphur solution until desired color is obtained. Rinse with water and blot dry.

22. Polish lightly with clean cloth and give a coat of lacquer to preserve finish.

References

A. *Home Workshop Manual,* Wakeling, Popular Science Publishing Co., New York City.

B. *Sheet Metal Workers Manual,* Broemel, F. S. Drake, Detroit, Mich.

C. *Metal Work,* Jones, Bruce Publishing Co., Milwaukee, Wis.

Questions

1. Tell how an object to be polished should be held against the buffing wheel. Reference A, page 207.

2. Can aluminum be soldered readily? Why? Reference B, page 453.

3. Name three ores from which aluminum is derived. Reference B, page 452.

4. State the relationship, if any, between a circle and a semicircle. Reference B, page 485.

5. Should a decoration to be used in a room be so constructed that it fits in with the design on other objects in the room? Explain. Reference C, page 46, part 5.

HISTORIC ORNAMENT DESIGNS FOR BOOK COVERS

D. Elizabeth Roberts, Philadelphia, Pennsylvania

The study of historic ornament makes a good basis for design. Among the many styles of ornament, as Egyptian, Greek, Gothic, Byzantine, Renaissance, Moresque, etc., two styles are illustrated in the book covers shown here.

For the book cover with the lettering, "Gothic Style" (Fig. 1), of course, Gothic ornament is used. This style is often used for ecclesiastical design and is very frequently seen in church architecture and windows.

The ornament on the book cover, "Legend of the Moor's Legacy," by Washington Irving is in the Moresque style. The Moor's religion prohibited the direct use of plant and animal life in their art, so their design is based on a geometrical plan.

These two designs may be used in various ways for the decoration of book covers or other useful objects. Of course, the lettering could be changed, any suitable title being used. Either design would make a good cover for a small scrap book or sketch book, to be used for examples of historic ornament or for any other purpose. The lettering, "Scrap Book" or "Sketch Book" could be substituted for the lettering shown. Heavy tinted paper or cardboard could be used, with sheets of plain paper between the covers, the whole fastened together with paper fasteners. The covers shown are 6 by 9 in. For a one-piece cover, the measurements may be made 12½ by 9 in., allowing a little extra for the thickness of the book.

These designs might also be used on leather, linen, or heavy-paper book jackets. The design may be done in water color and outlined with color or ink. The title of the book could be lettered with the same styles used for the titles shown in Figures 1 and 2.

The coloring for the Moorish design, Figure 2, is done in tones of greenish brown, with the color lighter in some places than others and the outline a dark brown. The background color is a tan with blues and browns blended in places to give an antique effect. This effect can be produced with a wash of color on white paper or a tinted or mottled paper could be used for the background.

The Gothic design in Figure 1, is on tan paper of a yellowish tone, with the design in brown and green, outlined with dark brown. Brown is used for the little floral forms in the corners of the border, the narrow edge in the borders and around the form which contains the lettering. The floral forms and the circle in the design for the center of the cover are also brown. The remainder of the design is green.

Another suggestion for their use is for the

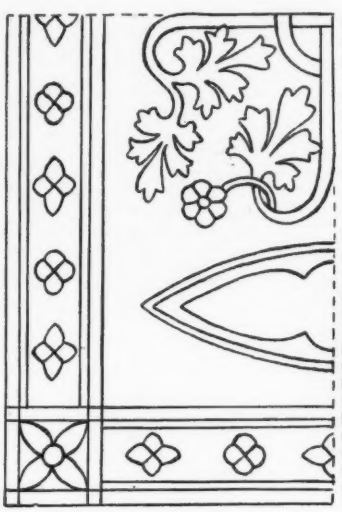

Fig. 3. One-quarter of book-cover design shown in Figure 1

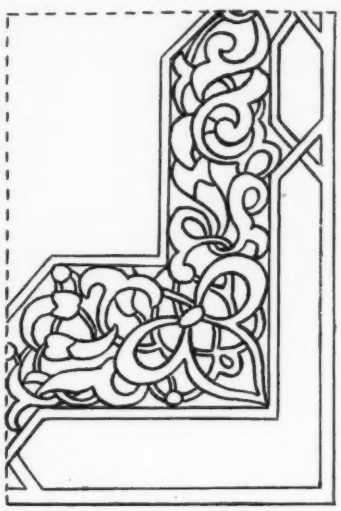

Fig. 4. One-quarter of book-cover design shown in Figure 2

FOR YOUR BULLETIN BOARD

POSTER 88 **NOVEMBER, 1937**

EFFICIENCY

Industry makes every move contribute to a desired result. The shopworker must learn to eliminate the nonessentials and include only the procedures which lead to a successful completion.

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Submitted by Professor L. M. Roehl, Cornell University, Ithaca, New York

Fig. 1

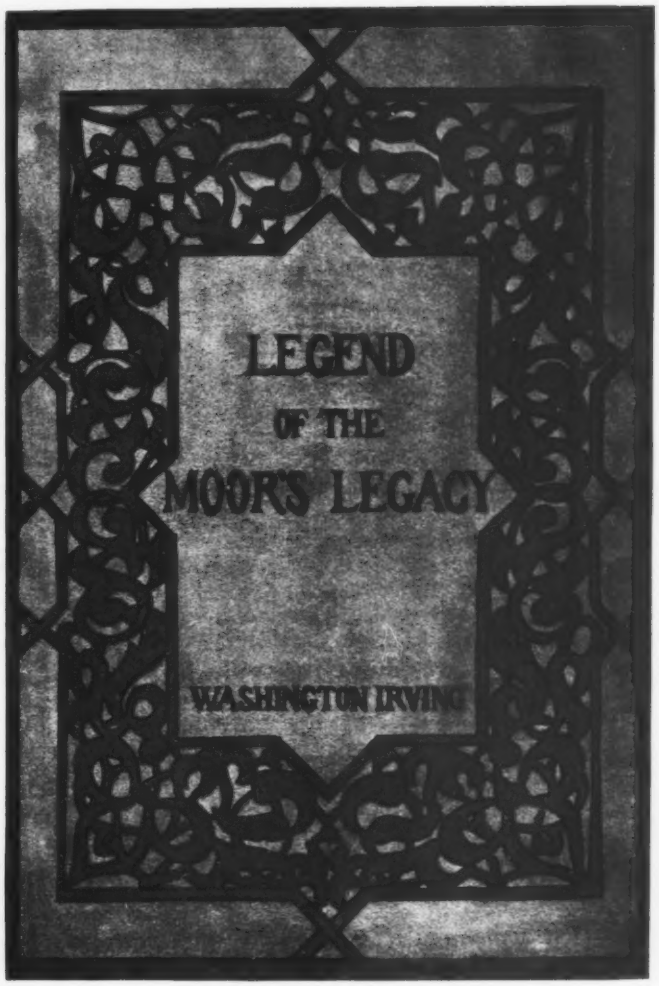


Fig. 2

tops of boxes and still other uses will no doubt suggest themselves to the individual worker.

It would be good practice to make other designs for book covers, bookmarks, boxes, cards, etc., using different styles of historic ornaments. In this way, much may be learned about the various styles of design that have been used throughout the ages.

ELECTRIC SCORE BOARD

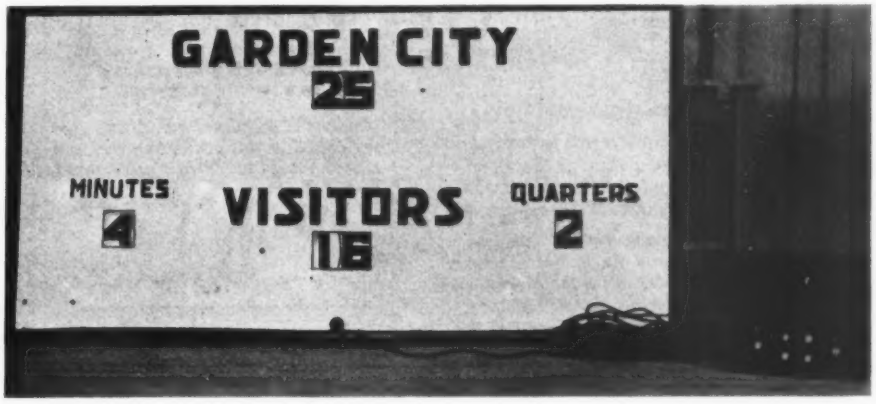
H. Allan Lacey, Garden City High School, Garden City, Long Island

The electric score board described in this article makes an excellent high-school industrial-arts project. It is entirely within the ability of the senior-high-school student and will be welcomed by the athletic department of any school.

The assembly drawing in Figure 1, shows the arrangement as we have it. This may be changed to suit individual needs. Disks may be added or left off. By referring to the drawing, the position and function of each part may be seen. The board *G* is a 6 by 3-ft. panel of ½-in. plywood. The windows are cut in this board. To the back of the panel are attached the frame and disk units. The frame *F* is made of ¼- by 1-in. iron. It is fastened to the board with stove bolts. The distance pieces between frame and board are made of 1-in. square blocks. The disk *A* on which the figures are painted, the ratchet wheel *E* and the hub *Q*, are riveted together and rotate freely on bolt *N*, between the panel and frame so that the figures show through the windows. The washers *W* in the hub assembly in Figure 2, are made up of thin sections so that proper clearance may be obtained.

The operating mechanism consists of solenoid *B*, plunger *C*, pawl *D*, guide *J*, spring *I*, and trip wire *L*. The assembly is mounted so that the lower end of the pawl engages a tooth in the ratchet wheel. Stop lever *K* is mounted so that its outer end moves up and down to engage slots *R*.

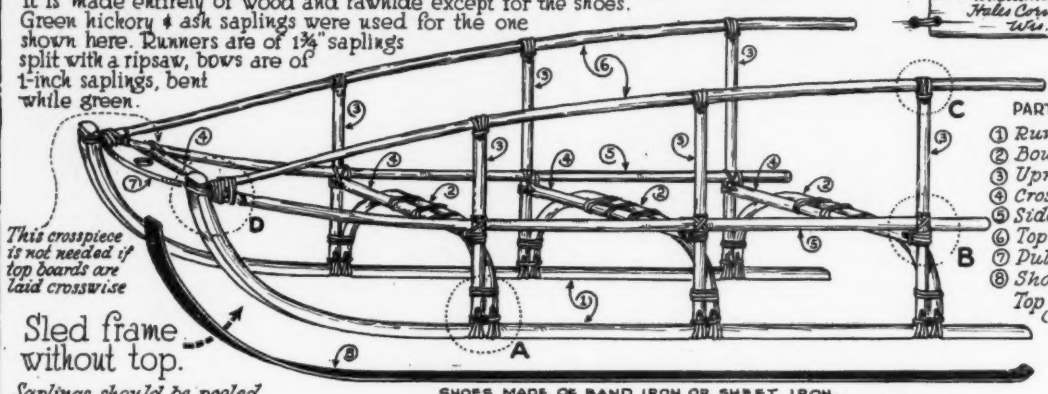
In operation, a current of from 12 to 16 volts is applied to the winding of the solenoid which draws the plunger upward against the tension of the spring until the pawl en-



ARCTIC HAND SLED

These sleds are used for hauling when no dogs are available or when a man pulls with one or two dogs. If a longer sled is wanted, simply add one or more sections. It is made entirely of wood and rawhide except for the shoes. Green hickory & ash saplings were used for the one shown here. Runners are of 1¾" saplings split with a ripsaw, bows are of 1-inch saplings, bent while green.

Sketch by W. Ben. Hunt, Hales Corners, Wis.

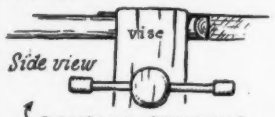


PARTS of SLED

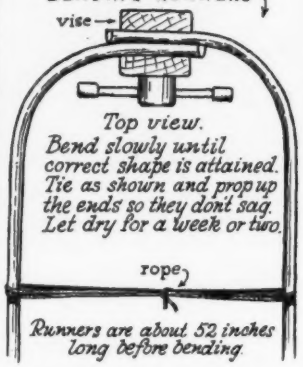
① Runners	2
② Bows	3
③ Uprights	6
④ Crosspieces	4
⑤ Side rails	2
⑥ Top rails	2
⑦ Pull bar	1
⑧ Shoes	2
Top boards (not shown)	

Saplings should be peeled.

SHOES MADE OF BAND IRON OR SHEET IRON.



BENDING RUNNERS



Top view. Bend slowly until correct shape is attained. Tie as shown and prop up the ends so they don't sag. Let dry for a week or two.

Runners are about 52 inches long before bending.

Eskimo sleds are usually built of odds and ends washed up by the sea or obtained from whalers. The different parts are tied together with walrus-hide thongs. If nails or screws were used, the wood would split when the sled received rough usage, but by using walrus-hide or rawhide fastenings, the sled becomes quite flexible and therefore is less likely to be broken. It is also easier to repair while on the trail as thongs of hide are always carried along.

The sled shown above is 43 inches long, 16 inches wide and about 6 inches high. The top rails at the rear of the sled are about 15 inches from the bottom of the runners. Note the slight upturn of the side rails at the front end of sled.

Rawhide should be soaked in water for about 12 hours before using and should be pulled as tight as possible when used.

PULL BAR

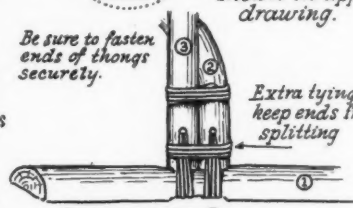
made of one-inch board to fit between side rails.

SECTION of BOWS

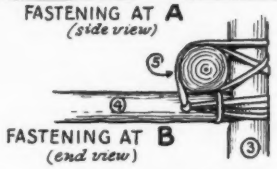
Wrap bows to crosspieces as shown in upper drawing.

Be sure to fasten ends of thongs securely.

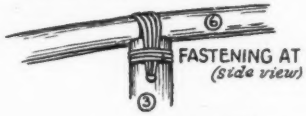
Extra tying to keep ends from splitting



FASTENING AT A (side view)

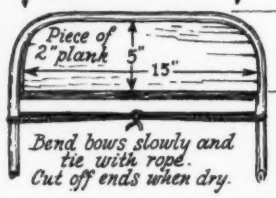


FASTENING AT B (end view)



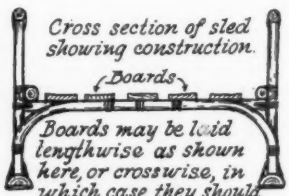
FASTENING AT C (side view)

BENDING BOWS



Bend bows slowly and tie with rope. Cut off ends when dry.

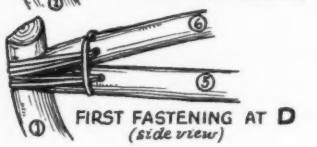
After rawhide wrappings have dried thoroughly give entire sled a coat or two of boiled linseed oil.



Cross section of sled showing construction.

Boards may be laid lengthwise as shown here, or crosswise, in which case they should rest on the side rails.

FITTING AT D



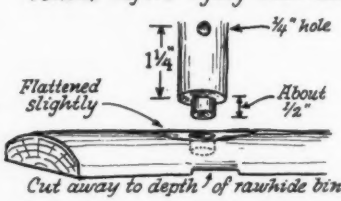
FIRST FASTENING AT D (side view)

SECTIONAL VIEW OF RUNNERS

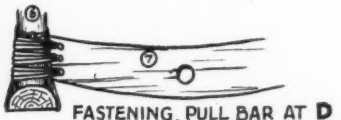
The only metal used is the strap-iron shoes and the screws to fasten them. Screws should be countersunk.

The Eskimos use iron or even tin when they can get it, but otherwise their sleds are shod with whalebone or thick rawhide. Sometimes shoes are made of wood fastened to the runners with walrus-hide thongs.

Below is shown how parts are set together with short mortise & tenons before tying with rawhide.



Cut away to depth of rawhide binding.



FASTENING PULL BAR AT D (top view)

Method of fastening top boards, lengthwise or crosswise.

gages one of the teeth of the ratchet wheel. At the same time the trip wire lifts the stop lever *K* from notch *R*. See arrangement in disk 1, Figure 1.

When the circuit is broken, the plunger is released and the pawl is pulled down by the spring turning the ratchet wheel and disk. Note that stop lever is now resting on the edge of the disk ready to drop into the next slot, as shown in disk 2, Figure 1. The finish of the down stroke is shown in disk 3.

Since the ratchet wheel has ten teeth, the above cycle of operation has moved the disk one tenth of a revolution and, with the figures 0 to 9 on the disk each cycle brings before the window a figure higher by one than the preceding one. The combination of disks 2 and 3 or 5 and 6 will show any number up to 99, disks 2 and 6 showing units and disks 3 and 5 showing tens. The disk showing quarters will necessarily have only figures 1, 2, 3, 4, the rest of the disk being blank. The disk showing the minutes to play can be marked in any way desired. Our board was made with the figures 15, 10, 5, 4, 3, 2, 1, ½.

The switchboard is a shallow box about 10 in. square, with push buttons flush with the top and corresponding to the disks in position. Connections are made inside and brought out to a female seven-prong connector in the side of the box. The control wires of the board are also brought to a connector in the front of the board. Connections between the score board and switchboard are made by a seven-wire cable.

When the operator is within 10 ft. of the board, the 16-volt operating current can be controlled by the push buttons without the use of relays. However, by the use of relays and a control circuit, as shown in the drawings, it is possible for the operator to be 100 or more feet distant. This is a desirable and necessary feature in a large gym where the board must be in a high, conspicuous place.

From the industrial-arts standpoint, this project offers another valuable feature. It can be improved upon. For this reason, too detailed instructions are not given. However, the following specifications from our board may be of help.

The disks and ratchet wheels are made of heavy-gauge galvanized iron. The hub is of brass, turned, faced, and drilled on the lathe. These parts are then carefully centered, drilled, and riveted together, being careful not to bend the disk. See Figure 1 and 2. The bearing hole through the frame and panel must be drilled at exactly right angles to the panel, or the disk will rub. Notches *R* may be filed in the disk, each one directly opposite a tooth in the ratchet wheel.

The core of the solenoid consists of a copper tube ⅜-in. inside diameter, and 2¼ in. long to each end of which is cemented a 1-in. disk of sheet fiber or other insulating material as shown in Figure 3. The tube is then insulated with several layers of waxed paper. Two small holes are drilled through the upper disk, one near the core and one near the outer edge through which the lead wires are brought. The tube is then wound full of No. 20 s.c.c. magnet wire, and the outside covered with friction tape. Over this is clamped the copper band and bracket. The plunger is a piece of

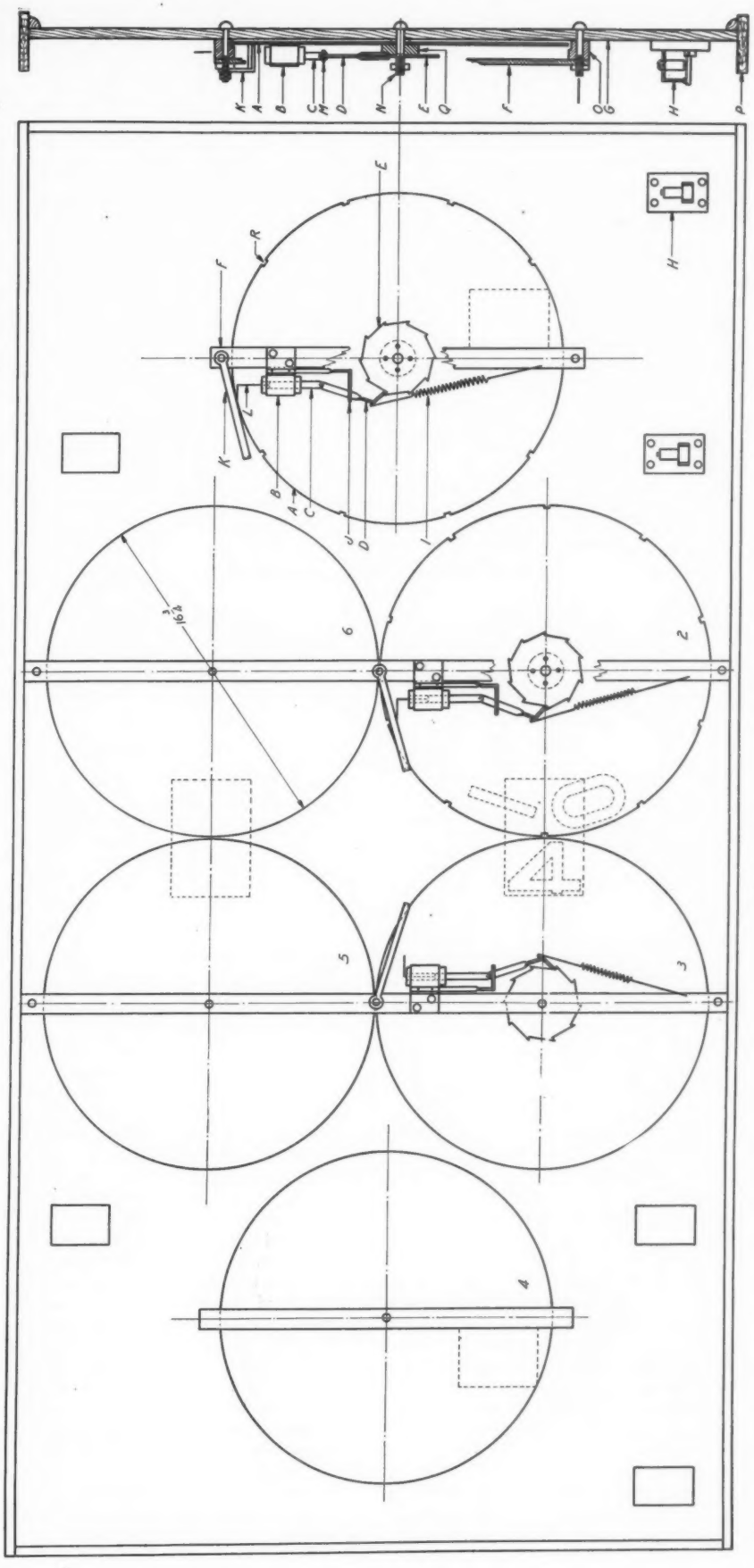
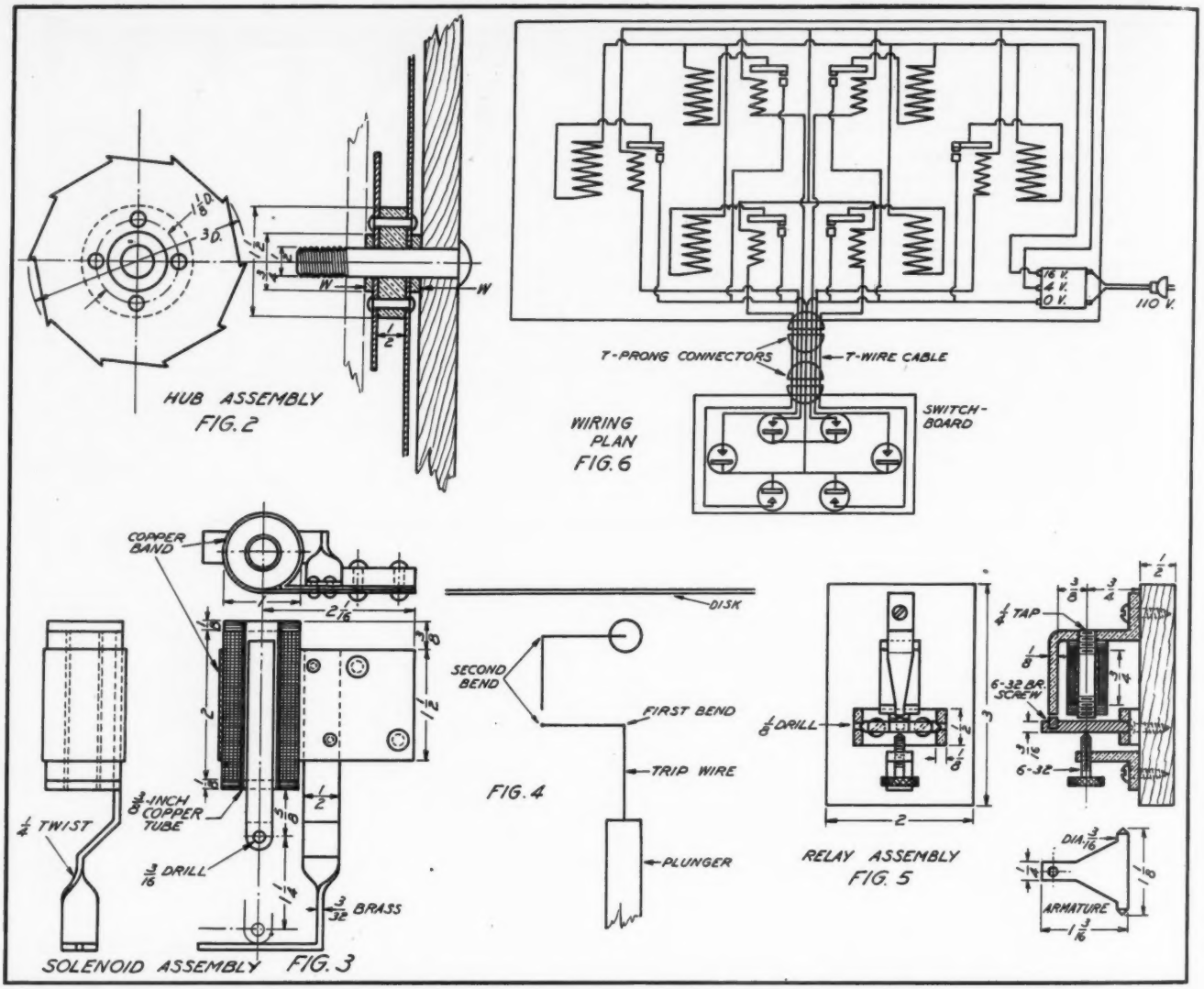


Fig. 1. Arrangement of disks



cold-rolled iron rod turned down to fit loosely in the tube. The top end is drilled and the trip wire is soldered into it. See Figure 4.

This trip wire is a piece of piano wire, .045 in. in diameter. It extends vertically for about 1½ in. and is then bent to a horizontal position parallel with the back of the disk. About 1⅛ in. from the first bend it is bent to the left at right angles so that the end section, about 1 in. long, extends under and at right angles to the stop lever. This end section is the part which comes in contact with the stop lever and lifts it from the notch.

The bottom of the plunger is drilled and slotted, and the pawl is pinned to it so that it can move freely. The guide, made of flat brass is formed and slotted and then riveted to the copper band after which the whole assembly is bolted to the frame as shown. Before fastening permanently, care should be taken to see that the pawl reaches the proper positions at both the upper and lower ends of the stroke.

The relay, shown in Figure 5, consists essentially of a coil, armature, and points. The core of the coil consists of a 1⅛ in. length of ¼ in. stove bolt. Fiber ends, ½ in. in diameter are drilled, tapped and screwed to either end of the core as shown in the drawing. The core is then insulated with waxed paper and the spool wound full of No. 26 s.c.c. magnet wire. The ends of the winding are brought out through the top end and connected to the control circuit direct or through binding posts.

The coil supporting bracket is made of ⅛ by ⅜ in. flat brass bent, drilled, and tapped as shown and the upper end of the coil core screwed into it. The free end of the bracket then becomes the top contact point of the operating circuit. The armature is made of band iron cut as shown in Figure 5, the bearing points ground, and the lower contact point screwed into the end. The armature support is made of ⅛ by ½ in. flat brass bent up at the ends and drilled to take the bearing points of the armature in a loose fit. The thumb screw supports the outer end of the armature at the height desired. One wire is fastened to the bracket above the upper contact point and one to the armature support. These wires are then connected to binding posts or direct to the operating circuit.

The multiple tap transformer is mounted on the back of the board and plugged into a convenient 110 volt outlet. Various voltages may be tried for both the control and operating circuits until the ones best suited are found.

The wiring diagram is shown in Figure 6.

CLOCK CASE

J. I. Sowers, Miami, Florida

For the clock case described herewith, select material of the best kind and quality available. If gumwood is used, it may be stained walnut. The ends may be made of constrasting wood.

Method of Procedure

1. Work out the sides to the dimensions shown in Figure 1.

2. Lay out and cut the hole for the watch in the front as shown in Figure 2. The hole may be made with a coping saw or bored out with an expansive bit.

3. Bevel the hole in front and carve out the rear to seat the watch. See Figure 2.

4. Work out the end plugs and glue front and back to them. Round off the two semicircular ends as shown in Figure 3.

5. Work out top and bottom pieces as shown in Figures 1 and 4. The base may be screwed or nailed on. The top is fitted with cleats as shown in Figure 4.

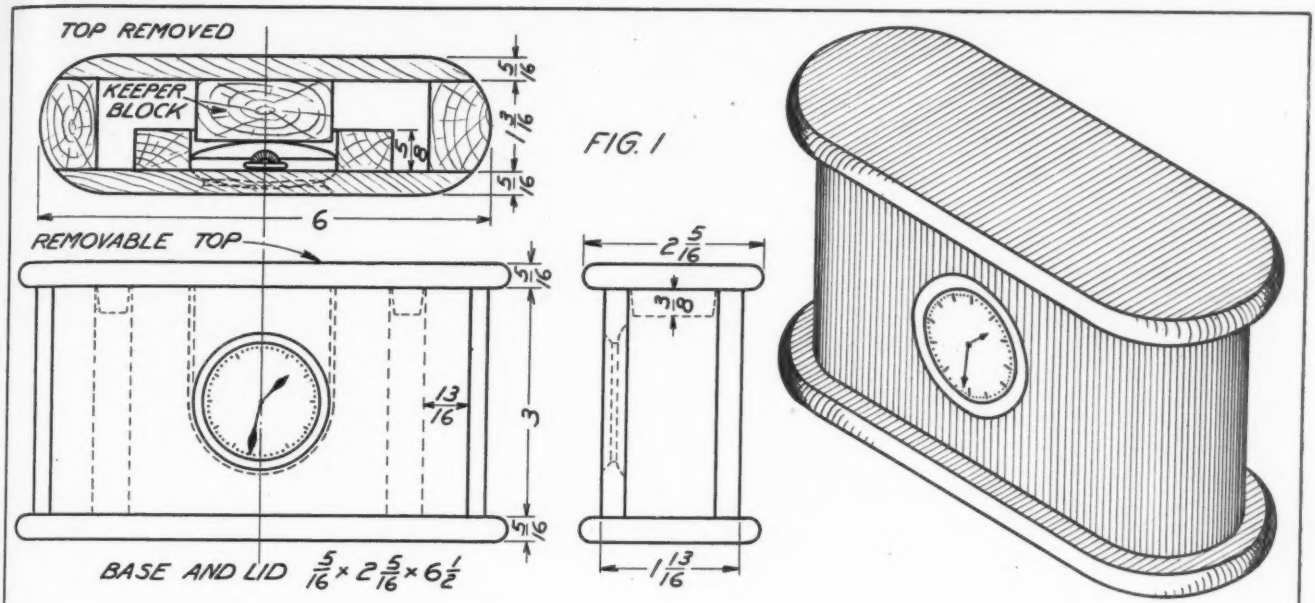


FIG. 1

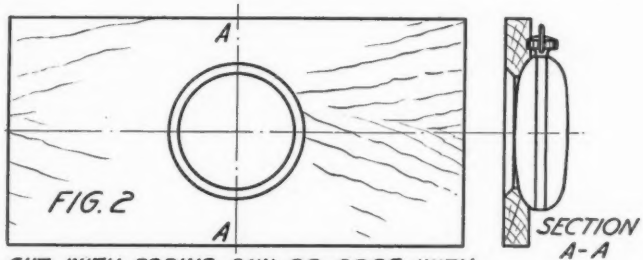


FIG. 2

CUT WITH COPING SAW, OR BORE WITH EXPANSION BIT. CUT BEFORE ASSEMBLING. BEVEL FRONT INTO DIAL AND CUT CURVE AT BACK TO SEAT WATCH.

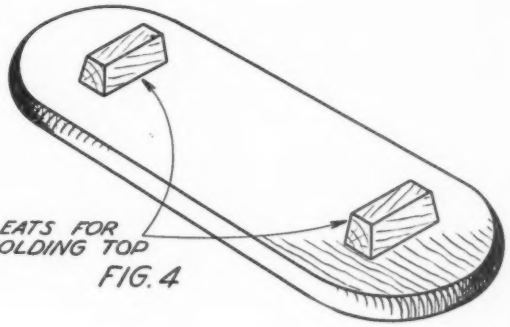
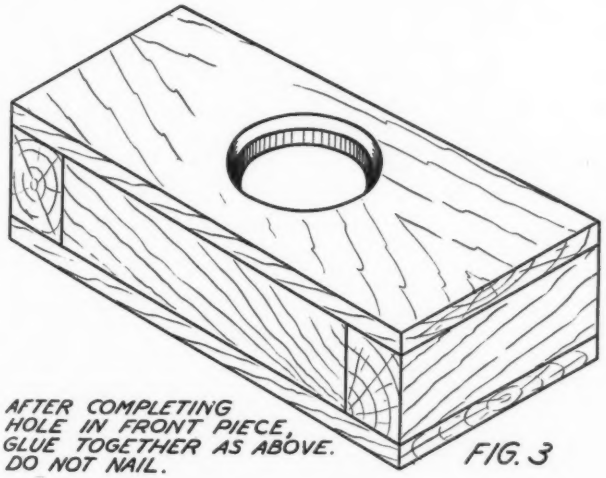


FIG. 4



AFTER COMPLETING HOLE IN FRONT PIECE, GLUE TOGETHER AS ABOVE. DO NOT NAIL.

FIG. 3

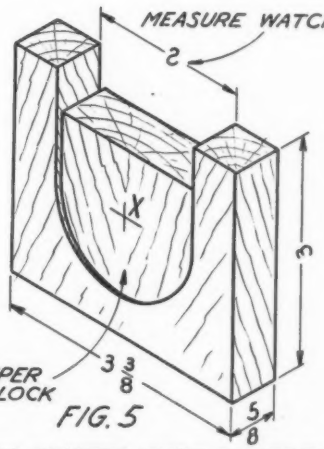
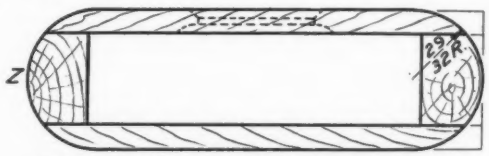


FIG. 5

"X" THIS CENTER MUST CONFORM IN POSITION TO CUT FOR WATCH IN CASE FRONT. LAY BOTH OUT AT SAME TIME. THIS FORM HOLDS WATCH IN PLACE.



LAY OFF ENDS IN SEMI-CIRCLES. CUT OFF AND WORK DOWN AS AT "Z"

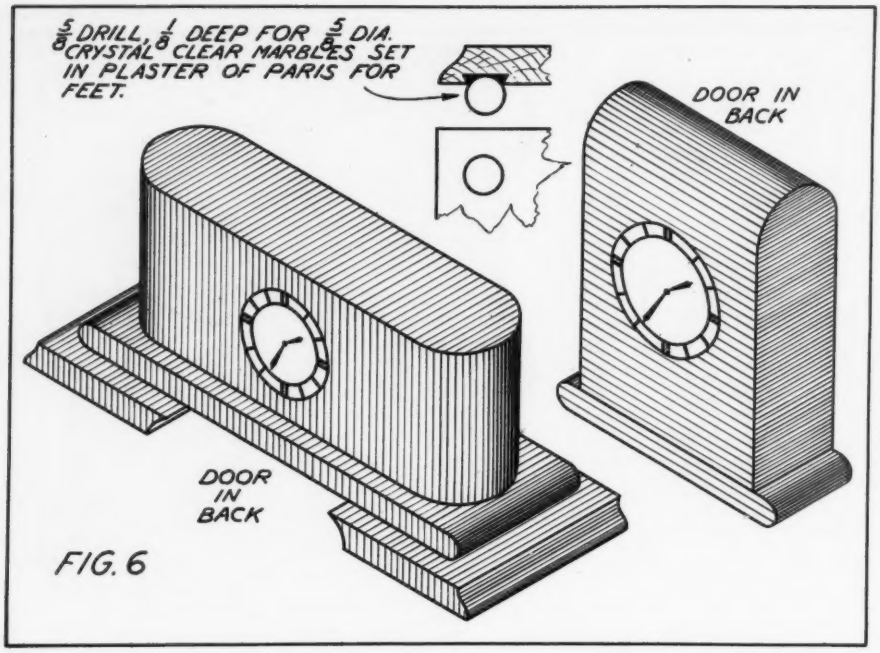


FIG. 6

6. Make the U block shown in Figure 5. This may be fastened in place with a single screw through the base.

7. Put the watch in place and determine the necessary size of the keeper block shown in Figure 5.

8. Stain and finish the entire case with French polish. If desired, the top and bottom may be stained black for contrast.

9. Glue on the felt base. Figure 6 shows how the design of the clock may be varied.

WOODSHOP TEST

W. G. Hjerstedt, Roosevelt High School, Chicago, Illinois

General Directions

The aim of this examination is to give you an opportunity to show what you have learned from your study of cabinetmaking. It is not expected that you will be able to answer every question. Read the directions and every statement carefully and be sure you understand what you are to do before you begin.

Specific Directions

Approximately half of the following statements are true and half false. Place a plus mark (+) before each statement which you think is true, a minus sign (—) before each which you think is false. Do not guess unless you are reasonably sure.

1. In drying, wood is likely to shrink. ( )+*
2. A screw-driver blade should be ground sharp like a chisel. ( )—
3. Sandpaper should be used across the grain. ( )—
4. A butt joint may be reinforced by means of dowels. ( )+
5. When clamping two pieces of wood together, the surface glue should be removed before it has time to set. ( )+
6. Dowels are also called bolts. ( )—
7. In drying, wood is likely to warp. ( )+
8. Finishes are applied to wood so that the appearance of the wood may be improved. ( )+
9. When great strength is required, brads are used. ( )—
10. The heartwood of a tree is the outer part. ( )—
11. When clamping two pieces of wood together, scrap wood should be used between the wood and the clamps as a protection. ( )+
12. Nails are used when surface finish is necessary. ( )—
13. One board foot contains 1,728 cubic inches. ( )—
14. A ripsaw is used to cut along curved lines. ( )—
15. The tool grinder's wheel should turn toward the edge of the tool. ( )+
16. The part of a tree which grows in the spring is softer than that which grows in summer. ( )+
17. The diameter of all brads having the same number (although their length may vary) is the same. ( )+
18. Stain is applied with waste. ( )—
19. When not in use, the plane should be on its side. ( )+
20. A ripsaw is used to cut against the grain. ( )—

*The key letter appears at the right of each test question.

Association News

WISCONSIN INDUSTRIAL-ARTS ASSOCIATION MEETING

The Wisconsin Industrial-Arts Association will meet November 4 to 6, in Milwaukee. The executive committee is at present formulating plans for the association for the year. Roy R. VanDuzee, West Allis, is secretary of the association.

WASHINGTON INDUSTRIAL-EDUCATION ASSOCIATION MEETS IN EVERETT

The second annual convention of the Washington Industrial-Education Association was held August 16 to 20, in Anacortes. Sixty-six teachers were in attendance from all parts of the state.

A variety of topics were discussed at the meeting. Speakers at the meeting were J. W. Kelly, State Supervisor of Industrial Education; Dean Edgar E. Loew, College of English, University of Washington; Prof. N. G. Whiffen, department of industrial arts, State College of Washington; and John H. Binns, state director, National Youth Administration, Tacoma.

The annual business meeting was held on August 18, and officers were nominated for the next year as follows:

President, H. G. Halstead, Seattle; secretary, A. H. Drews, Everett; vice-president, F. W. Thwaites, Wenatchee; vice-president, W. L. Sundstrom, Yakima; vice-president, C. T. Miller, Tacoma.

Nearly all the teachers brought their families and an enjoyable recreational program was combined with the educational. Max E. Waldron was chairman of the committee on arrangements.—*A. H. Drews.*

Teachers at the Washington Industrial Education Association Annual Conference

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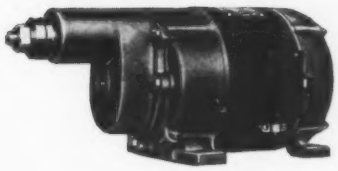

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Personal News

Mr. Scott Williamson, of Burkburnett, Tex., has been elected instructor in manual training in the Reagan Junior High School, Wichita Falls.

Mr. Jay F. Knowlton, a member of the faculty of the Hibbing Junior College, Hibbing, Minn., died on August 6, following an operation. He had taught more than twenty-five years and for the past twelve years had been head of the industrial-arts department.

Mr. Carlton W. Erickson, Director of Visual Education in Greenfield Public Schools, Greenfield, Mass., gave a course on this subject at the Fitchburg State Teachers College during the past summer and is offering a course in Springfield under University Extension auspices during the winter.

Mr. Arnold Kolder has been appointed as industrial-arts instructor in the Pontiac High School at Pontiac, Mich.

Mr. Clyde A. Bowman, of Stout Institute was a member of the faculty at the summer session of the Colorado Agricultural College at Fort Collins. He reported the classes as large, and satisfactory reactions from the students.

Miss Beatrice Olson has been appointed a member of the faculty of the department of vocational education at Detroit, Mich.

Mr. Sumner N. Horton has been added to the guidance and placement department at Detroit, Mich.

Mr. J. Bussman has been appointed to the staff of the Cass Technical High School, in Detroit, Mich.

Mr. Arthur Wells has become a member of the faculty at the South Western High School, in Detroit, Michigan.

Mr. Clarence H. Blanchard has been appointed as counselor at the Northern High School, in Detroit, Mich.

Mr. John A. Whitesel has become professor of industrial-arts education at the Teachers College of Connecticut in New Haven. He was formerly director of industrial arts at Dayton, Ky.

New Publications

How to Design Period Furniture

By Franklin H. Gottshall. Cloth, 260 pages, 7¾ by 10⅝, illustrated. Price, $3.75. Published by The Bruce Publishing Company, Milwaukee, Wis.

Drawing upon his own experience, the author has put into this book workable rules for the learner who aspires to design furniture. He also has furnished a large number of illustrations showing pieces of period furniture in which the applications of the rules of design which he has laid down may be studied.

The principles of design are treated in five chapters and eleven chapters are devoted to period styles. Color harmony, upholstering and historic background of the various periods also are fully covered. The book contains 63 plates and 266 individual illustrations.

History of Manual and Industrial Education 1870 to 1917

By Charles A. Bennett. Cloth, 6 by 9, 566 pages, illustrated. Price, $4.

This is the second volume of the history of industrial arts and vocational education. Like the first, it is based on a great deal of painstaking research, and the author deserves the gratitude of every teacher of industrial arts and vocational education for this most excellent contribution to the professional literature in their field.

Finding Yourself in Your Work

By Harry Walker Hepner. Cloth, 297 pages, 6 by 8¾, illustrated. Price, $2.75. Published by D. Appleton-Century Company, New York City.

The author calls attention to the fact that the person trying to find himself vocationally must have more than a knowledge of occupations, since personality and the development of personality has much to do with success in any occupation. The book is divided into three parts. The first one is devoted to a study of one's own personality, the second gives directions for evaluating one's vocational and educational capabilities, the third presents a number of tests — intelligence, personality, maturity, and social knowledge — which may all be self-administered and scored.

Furnishing the Colonial and Federal House

By Nancy McClelland. Cloth, 164 pages, 8⅞ by 10¼, illustrated. Price, $3.50. Published by J. B. Lippincott Company, Philadelphia, Pa.

This book pictures and describes fine historic old pieces of furniture as they appeared in their original or in modern adapted settings. It is a great help, therefore, to the layman in visualizing the beauty of this type of furniture in proper surroundings. The author of this book is a well-known authority in the field of home decoration.

Rational Mechanical Drawing

By F. A. P. Fischer and George G. Greene. Part I, text and plates, paper, 8 by 9½, illustrated. Price, 38 cents. Part II, detachable lettering sheets and tests, paper, 8 by 9½, illustrated. Price, 36 cents. Published by The Bruce Publishing Company, Milwaukee, Wis.

This well-known first-year drawing book now appears in a revised and enlarged edition. As is indicated above, text and plates, and the detachable lettering sheets and tests, appear in two separate books.

(Concluded on page 12A)

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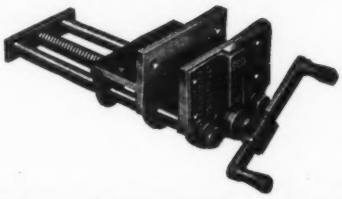

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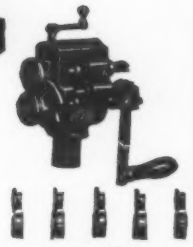

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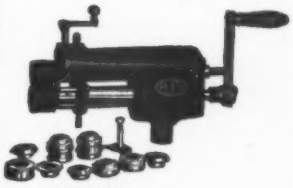

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Educational Department, New Britain, Conn.

(Concluded from page 10A)

Machine Tool Operation

By Henry D. Burghardt. Cloth, 512 pages, 5¼ by 7⅝. Price, $2.75. Published by McGraw-Hill Book Co., New York City.

This is the second edition of this well known book on machine tool operation. Much new material has been added with many new illustrations and descriptions. A chapter on the hydraulic drive of machine tools also has been added.

Creative Design in Furniture

By William H. Varnum. Cloth, 160 pages. 6⅛ by 9¼, illustrated. Price, $2.50. Published by The Manual Arts Press, Peoria, Ill.

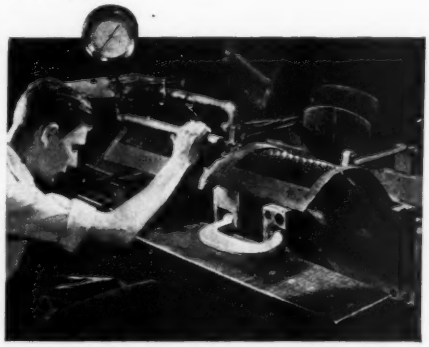
In this book the author has laid down a statement of principles for those who want to design furniture following the modern trend. Illustrations are shown of how the new plastics, bent wood, glass, and the various types of metal shapes are now used in what is known as "modern furniture."

High School English — Book 4

By Henry S. Canby, John B. Opdycke, Margaret Gillum, and Olive I. Carter. Cloth, 402 pages, 5½ by 8, illustrated. Price, $1.20. Published by The Macmillan Company, New York City.

New Products

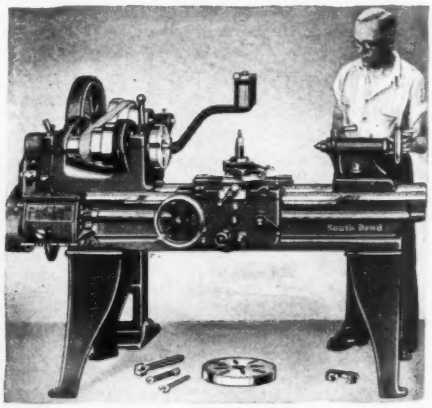
¶ The automatic, hydraulic testing device used by the Cincinnati Tool Co., Cincinnati, Ohio, for testing its clamps was designed to eliminate all those having defects which will cause them to fail when they are subjected to the strains for which they were designed. The device has been tested in regular use and the clamps tested by it have proved so satisfactory to operators, that jigs also have been made and adapted for testing of maple handscrew jaws.



Machine for testing clamps

The Hargrave tested hand screws and clamps cost no more than untested tools and are made in a variety of sizes and patterns. Complete information is available upon request.

¶ The newly designed back-geared, screw-cutting, precision lathe, just placed on the market by the South Bend Lathe Works, South Bend, Ind., is a pedestal, adjustable, motor-driven mechanism, with a separate unit, with the motor and countershaft mounted on a pedestal back of the lathe. The power is transmitted to the countershaft, by V belts, and from the countershaft by a flat leather belt, which insures a smooth, steady pull, free from vibration and chatter. A reversible switch near the lathe spindle permits the operator to start, stop, and reverse the rotation of the lathe from an easy working position. An adjustable tension brace between the countershaft and the lathe equalizes the pull of the belt. Other features are ample power, rigidity for taking heavy cuts, and accuracy of construction to insure the most exacting tool work. Substantial design insures alignment of headstock, tailstock, and other major units.



New South Bend Lathe

(Concluded on page 15A)

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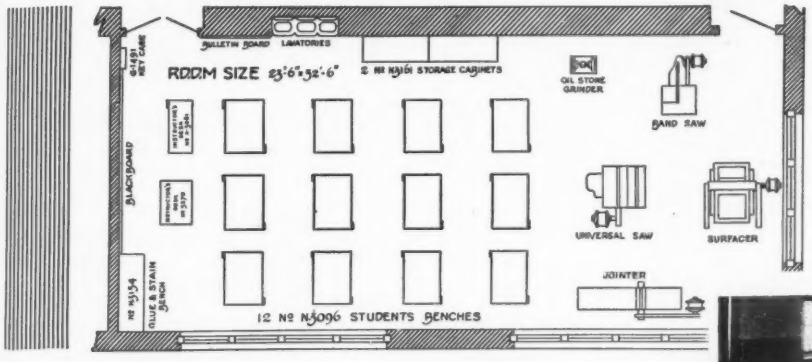

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Representatives in Principal Cities

(Concluded from page 12A)

The company has available a new series of bulletins describing each of the five sizes of lathes, which will be sent to any instructor upon request.

¶ A new series of belt guards, just placed on the market by the Atlas Press Company, Kalamazoo, Mich., effectually removes the hazards of exposed lathe belting, a matter of vital importance to any school machine shop.

New Belt Guards

The guards are in the form of aluminum castings, with pin hinges so that the guards may be quickly raised when making speed changes. The entire device is ready tapped for easy installation.

Complete information will be sent to any school shop instructor upon request.

News Notes

Stout Institute Opens with Large Enrollment

The regular fall and winter session of The Stout Institute opened with a fine enrollment. The total registration was well over 530 students, of whom 280 were men. There is a growing demand for good teachers this year.

Summer Session at Stout Institute

A total of 422 enrolled for the 1937 summer session at The Stout Institute, Menomonie, Wis. Of these 134 were graduate students. The students came from 28 states, Hawaii, and New Brunswick.

At the session, a wide variety of courses was offered for teachers and executives, and those interested in home economics and industrial education. In addition to the six-week course a carefully selected "social frontier group" of three-week short-unit courses was offered. Among those in charge were H. A. Tiemann, Denver, Colo.; C. L. Wetzel, St. Louis, Mo.; Dr. Margaret Wylie, Cornell University, Ithaca, N. Y.; L. R. Evans, Sheboygan, Wis.; I. G. Fay, Madison, Wis.; W. F. Faulkes, Madison, Wis.

Supplementing the six- and three-week courses, a series of special one- and two-day conferences was held. The leaders were drawn from the ranks of national leaders, and the program of events also included several special lectures.

In addition to the usual social activities, an expanded program was initiated by the Graduate Club, Epsilon Pi Tau, and similar organizations. The Stout summer-camp colony was again in operation.

Industrial-Arts Forum

The Cornell University at Ithaca, New York, at its recent summer session, held a number of industrial-arts forum meetings, which were informal in character and provided opportunity for the men to take part in programs and planning. A total of five meetings were held, which took up such phases as industrial-arts planning, visual aids in industrial arts, research projects, and leadership. Another feature was a five-day conference on youth problems.

The forum was initiated by the New York State Department of Education, in co-operation with the Graduate School of Education of Cornell University and the meetings were well attended.

Metropolitan Museum of Art Lectures

The Metropolitan Museum of Art of New York City has announced the new program of lectures for 1937–38, covering the months of October through January. Five afternoons will be devoted to paintings and the related field of prints; two to Egyptian art; three to the arts of Greece and Rome; two to the Far and Near East; two to the Middle Ages; and four to French, English, and American furniture and decorative arts. There will also be offered a course on the development of furniture styles in addition to the series of lectures on paintings.

New Advisory Committee on Industrial Arts

A movement for a state advisory committee on industrial arts has been initiated and sponsored by the industrial division of the Oklahoma Education Association. The committee will function in a purely advisory capacity and will be divided into subcommittees for work on several important problems confronting the field in Oklahoma. Members of the committee will serve without re-

(Concluded on page 17A)

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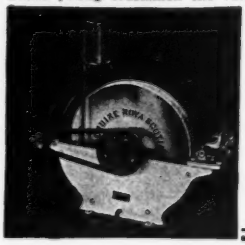

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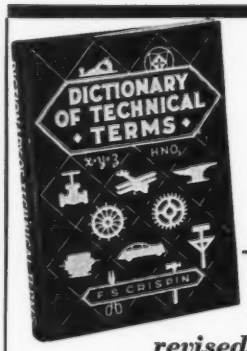

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NEWS NOTES

(Concluded from page 15A)

muneration and appointment will be for a term of from one to three years. The membership of the committee will be representative of all phases of industrial-arts work in the state.

Psychological Tests for Determining Ability

Psychological tests are being used in North Carolina for determining the abilities of applicants for vocational rehabilitation. Out of 100 cases given special business or vocational training on the basis of preparedness, as determined by these tests, compared with 100 cases given similar training before the use of tests, it was found that the tests had reduced failures to approximately 50 per cent. During the sixteen years the rehabilitation division has been in operation, thousands of crippled and physically handicapped men and women have been given special training which enabled them to become independent and self supporting.

Announce New Department

The Princeton, Ky., City Schools announce the installation of a new department of electrophysics. This class studies household machine repairs, refrigeration repairs, and radio repairs, and also has short-wave transmission and receiving sets. Application has been made for a permit for a school transmission license, but at present the students are experimenting over portable station W9OQE.

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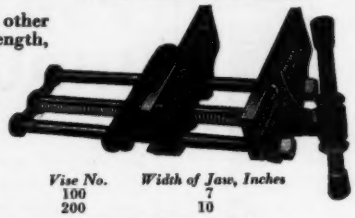

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